INSTALLATION/OPERATION MANUAL

REFLECTION

# RS-440 Series

**Digital Light Processing™ Projectors**
**RS-440**
**RS-440LT**
**RS-440LT/CineWide**

RUNCO

THE WORLD'S FINEST HOME THEATER PRODUCTS™

# TWO YEAR LIMITED WARRANTY

## For Projectors, Video Processors and Controllers

Congratulations on your purchase of a Runco video product and welcome to the Runco family! We believe Runco produces "The World's Finest Home Theater Products." With proper installation, setup and care, you should enjoy many years of unparalleled video performance.

This is a LIMITED WARRANTY as defined in the Magnuson-Moss Warranty Act. Please read it carefully and retain it with your other important documents.

### WHAT IS COVERED UNDER THE TERMS OF THIS LIMITED WARRANTY:

SERVICE LABOR: Runco will pay for service labor by a Runco Authorized Service Center when needed as a result of manufacturing defect for a period of two (2) years from the effective date of delivery to the end user (excluding the lamp).

PARTS (not including the lamp): Runco will provide new or rebuilt replacement parts for the parts that fail due to defects in materials or workmanship for a period of two (2) years from the effective date of delivery to the end user. Such replacement parts are then subsequently warranted for the remaining portion (if any) of the original warranty period.

PROJECTOR LAMP: Runco will pay for service labor by a Runco Authorized Service Center when needed as a result of a manufacturing defect for a period of six (6) months or 1000 hours, whichever comes first, from the effective date of delivery to the end user. In addition, Runco will provide a new or rebuilt replacement lamp for the lamp that fails due to defects in materials or workmanship for a period of six (6) months or 1000 hours, whichever comes first, from the effective date of delivery to the end user. Such replacement lamps are then subsequently warranted for the remaining portion (if any) of the original warranty period.

### WHAT IS NOT COVERED UNDER THE TERMS OF THIS LIMITED WARRANTY:

This Limited Warranty only covers failure due to defects in materials and workmanship that occur during normal use and does not cover normal maintenance. This Limited Warranty does not cover cabinets or any appearance items; failure resulting from accident, misuse, abuse, neglect, mishandling, misapplication, faulty or improper installation or setup adjustments; improper maintenance, alteration, improper use of any input signal; damage due to lightning or power line surges, spikes and brownouts; damage that occurs during shipping or transit; or damage that is attributed to acts of God. In the case of remote control units, damage resulting from leaking, old, damaged or improper batteries is also excluded from coverage under this Limited Warranty.

CAUTION: THIS LIMITED WARRANTY ONLY COVERS RUNCO PRODUCTS PURCHASED FROM RUNCO AUTHORIZED DEALERS. ALL OTHER PRODUCTS ARE SPECIFICALLY EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. MOREOVER, DAMAGE RESULTING DIRECTLY OR INDIRECTLY FROM IMPROPER INSTALLATION OR SETUP IS SPECIFICALLY EXCLUDED FROM COVERAGE UNDER THIS LIMITED WARRANTY. IT IS IMPERATIVE THAT INSTALLATION AND SETUP WORK BE PERFORMED ONLY BY AN AUTHORIZED RUNCO DEALER TO PROTECT YOUR RIGHTS UNDER THIS WARRANTY. THIS WILL ALSO ENSURE THAT YOU ENJOY THE FINE PERFORMANCE OF WHICH YOUR RUNCO PRODUCT IS CAPABLE WHEN INSTALLED AND CALIBRATED BY RUNCO AUTHORIZED PERSONNEL.

### RIGHTS, LIMITS AND EXCLUSIONS:

Runco limits its obligations under any implied warranties under state laws to a period not to exceed the warranty period. There are no express warranties. Runco also excludes any obligation on its part for incidental or consequential damages related to the failure of this product to function properly. Some states do not allow limitations on how long an implied warranty lasts, and some states do not allow the exclusion or limitation of incidental or consequential damages. So the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

## EFFECTIVE WARRANTY DATE:

This warranty begins on the effective date of delivery to the end user. For your convenience, keep the original bill of sale as evidence of the purchase date.

## IMPORTANT – WARRANTY REGISTRATION:

Please fill out and mail your warranty registration card. It is imperative that Runco knows how to reach you promptly if we should discover a safety problem or product update for which you must be notified.

## CONTACT A RUNCO AUTHORIZED SERVICE CENTER TO OBTAIN SERVICE:

Repairs made under the terms of this Limited Warranty covering your Runco video product will be performed at the location of the product, during usual working hours, providing location of product is within normal operating distance from a Runco Authorized Service Center. In some instances it may be necessary for the product to be returned to the Runco factory for repairs. If, solely in Runco's judgment, location of product to be repaired is beyond normal operating distance of the closest Runco Authorized Service Center, or the repair requires the unit be returned to the Runco factory, it is the owner's responsibility to arrange for shipment of the product for repair. These arrangements must be made through the selling Runco Dealer. If this is not possible, contact Runco directly for a Return Authorization number and shipping instructions. Runco will return product transportation prepaid in the United States, unless no product defect is discovered. In that instance, shipping costs will be the responsibility of the owner.

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Runco International products are manufactured under one or more of the following patents: US. Patent 6755540 and Other Patents Pending.

**ADDITIONAL INFORMATION:**

To locate the name and address of the nearest Runco Authorized Service Center, or for additional information about this Limited Warranty, please call or write:

**RUNCO INTERNATIONAL, INC.**
**Attn: Customer Service Department**
**2900 Faber Street**
**Union City, CA 94587**
**Ph: (510) 324-7777**
**Fax: (510) 324-9300**
**Toll Free: (800) 23-RUNCO**

## RUNCO VIDEO-PRODUCT INFORMATION
## RETAIN THIS INFORMATION FOR YOUR RECORDS

_____ _____

Model Purchased Date

_____

Serial Number

_____

Runco Authorized Dealer Name

_____

Address

_____ _____ _____

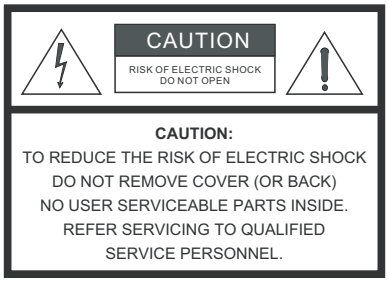
City State/Province Postal Code

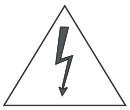
_____ _____

Phone Fax

# Important Safety Instructions

Thank you for your purchase of this quality Runco video projector! It has been designed to provide you with the quality of video that is expected in a home theater. For the best performance, please read this manual carefully as it is your guide through the menus and operation.



WARNING
This symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with a dry cloth.
7. Do not block any of the ventilation openings. Install in accordance with the manufacturer’s instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. When the provided plug does not fit into your outlet, consult an electrician for the replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
11. Only use the attachments/accessories specified by Runco.
12. Use only with a cart, stand, tripod, bracket or table specified by the manufacturer or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus to avoid injury from tip-over.

13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. The +12V trigger only outputs 12Vdc signal for triggering. Do not connect to any other power input or output. This could cause damage to this unit.
16. Keep the packing material in case the equipment should ever need to be shipped.
17. The lamp becomes extremely hot during operation. Allow the projector to cool down for approximately 45 minutes prior to removing the lamp assembly for replacement.

18. Do not operate lamps beyond the rated lamp life. Excessive operation of lamps beyond rated life could cause them to explode in rare occasions.
19. Never look directly into the lens when the lamp is on.

# Compliance Information

## DECLARATION OF CONFORMITY:

Manufacturer's Name: Runco International, a subsidiary of Planar Systems, Inc.

Manufacturer's Address: 2900 Faber Street, Union City, CA 94587

hereby declares that the products Model Numbers:

RS-440, RS-440LT and RS-440LT/CineWide

conform with the provisions of:

Council Directive 2004/108/EC on Electromagnetic Compatibility;

EN 55022 "Limits and methods of measurements of radio interference characteristics of information technology equipment" 1998;

EN 55024 "Limits and methods of measurements of immunity characteristics of information technology equipment" 1998;

Including:

- EN 61000-4-2 "Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 2: Electrostatic discharge immunity test"
- EN 61000-4-3 "Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 3: Radiated, Radio-Frequency, Electromagnetic Field Immunity Test"
- EN 61000-4-4 "Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 4: Electrical fast transient/burst immunity test"
- EN 61000-4-5 "Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 5: Surge immunity test"
- EN 61000-4-6 "Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 6: Conducted disturbances induced by radio-frequency fields immunity test"
- EN 61000-4-8 "Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 8: Conducted disturbances induced by power frequency magnetic fields immunity test"
- EN 61000-4-11 "Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 11: Voltage dips, short interruptions and voltage variations immunity tests"

And:

- EN 61000-3-2 "Electromagnetic compatibility (EMC) Part 3, Section 2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)" 2000;
- EN 61000-3-3 "Electromagnetic compatibility (EMC) Part 3, Section 3: Limitations of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current up to and including 16 A and not subject to conditional connection" 1995;

Council Directive 2006/95/EC and amended by M1 and C1 on Low Voltage Equipment Safety;

EN 60950 "Safety of information technology equipment, including electrical business equipment"

The Technical Construction file required by this Directive is maintained at the corporate headquarters of Planar Systems, Inc., 1195 NW Compton Drive, Beaverton, OR 97006.

Date of Declaration: January 2008

## FCC PART 15:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## INDUSTRY CANADA (ICES-003):

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

## PRODUCT DISPOSAL

This projector utilizes a tin-lead solder, UHP Lamp containing a small amount of mercury. Disposal of these materials may be regulated due to environmental considerations.

## IMPORTANT RECYCLE INSTRUCTIONS

Lamp(s) inside this product contain mercury. This product may contain other electronic waste that can be hazardous if not disposed of properly. Recycle or dispose in accordance with local, state, or federal Laws.

For more information, contact the Electronic Industries Alliance at WWW.EIAE.ORG.

For lamp specific disposal information check WWW.LAMPRECYCLE.ORG.

## DISPOSAL OF OLD ELECTRICAL AND ELECTRONIC EQUIPMENT (Applicable throughout the European Union and other European countries with separate collection programs)

This symbol found on your product or on its packaging, indicates that this product should not be treated as household waste when you wish to dispose of it. Instead, it should be handed over to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product. The recycling of materials will help to conserve natural resources. This symbol is only valid in the European Union. If you wish to discard this product, please contact your local authorities or dealer and ask for the correct method of disposal.

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## Notes:

# 1. Introduction

## 1.1 About This Manual

This Owner's Manual describes how to install, set up and operate a Runco RS-440 Series Digital Light Processing (DLP™) Projector. This product family consists of three models:

- RS-440
- RS-440LT (Long-Throw)
- RS-440LT/CineWide

Throughout this manual, all three projectors are referred to collectively as the "RS-440." The information in this manual applies to all three projectors except where otherwise indicated.

### ◄ *Target Audience*

Runco has prepared this manual to help home theater installers and end users get the most out of the RS-440.

Runco has made every effort to ensure that this manual is accurate as of the date it was printed. However, because of ongoing product improvements and customer feedback, it may require updating from time to time. You can always find the latest version of this and other Runco product manuals on-line, at www.Runco.com.

### ◄ *If You Have Comments About This Manual...*

Runco welcomes your comments about this manual. Send them to techpub@runco.com.

### ◄ *Textual and Graphic Conventions*

**Text Conventions:** The following conventions are used in this manual, in order to clarify the information and instructions provided:

- Remote and built-in keypad button identifiers are set in upper-case bold type; for example, "Press **EXIT** to return to the previous menu."
- Computer input (commands you type) and output (responses that appear on-screen) is shown in monospace (fixed-width) type; for example: "To change the aspect ratio to Letterbox, type `RRD02`."
- All keys with functional names are initial-capped, set in bold type and enclosed in angle brackets. These keys are the following: **<Enter>, <Spacebar>, <Control>, <Esc>** and **<Tab>**.
- **<Enter>** indicates that you may press either the RETURN or ENTER key on your keyboard if it has both keys.

In addition to these conventions, underlining, boldface and/or italics are occasionally used to highlight important information, as in this example:

***Note***

*A carriage return **must** be used after each command or string.*

**Graphic Conventions:** These symbols appear in numerous places throughout the manual, to emphasize points that you must keep in mind to avoid problems with your equipment or injury:

| | |
|---|---|
| ***Tip*** | *TIPS highlight time-saving short cuts and helpful guidelines for using certain features.* |
| ***Note*** | *NOTES emphasize text with unusual importance or special significance. They also provide supplemental information.* |
| ***Caution*** | *CAUTIONS alert users that a given action or omitted action can degrade performance or cause a malfunction.* |
| ***WARNING*** | *WARNINGS appear when a given action or omitted action can result in damage to the equipment, or possible non-fatal injury to the user.* |
| ***DANGER!*** | *DANGER appears when a given action can cause severe injury or death.* |

## 1.2 Using This Manual

Use the following table to locate the specific information you need in this manual.

| If you need... | ... Turn to page: |
|---|---|
| Information about obtaining service | iv |
| General information about the RS-440 DLP Projector | 3 |
| Installation instructions | 11 |
| First-time configuration instructions | 30 |
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| Troubleshooting tips | 59 |
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## 1.3 Description, Features and Benefits

The Runco RS-440 DLP Projector combines a highly efficient optical light engine with broad installation and integration options.

Runco has implemented a host of advancements into the projector's light engine to take full advantage of its widescreen, high-definition SuperOnyx™ Digital Micromirror Device (DMD™) chip. The RS-440 features Enhanced GEN 3™ technology to produce deeper blacks, greater contrast ratio and brightness, and richly saturated colors.

Among the RS-440's features are a sophisticated color-balancing system that results in the industry's best gray scale tracking, and far surpasses the capabilities of CRT projectors. Accurate gray scale reproduction is vital to vibrant, true-to-life color reproduction, as well as superior black level and white level performance. Runco's acclaimed Vivix™ video processing and scaling assure pristine video imagery, while the RS-440's generous light output capability is powerful enough to handle screens as large as 96 inches wide with ease.

The RS-440 features a 16:9 aspect ratio resolution of 1280 x 720. It provides an HDMI input for pure digital video signal transmission. In addition, the projector's broad lens shift capability, variable throw distance, and electronic horizontal and vertical keystone correction allow for flexible placement within virtually any theater environment. Discrete IR and/or serial control makes it simple to partner the RS-440 with other audio/video components and automated control systems for a truly high-end, home cinema system.

For uncompromising widescreen reproduction of movies originally filmed in the "scope" (2.35:1) format, the RS-440 can be equipped with Runco's patent-pending CineWide™ technology, a combination of software, electronics and high-quality anamorphic optics. CineWide maintains constant vertical height on the screen just as in a movie theater. When a viewer transitions from 1.78:1 (16:9) program material to 2.35:1, the image simply gets wider while full height is maintained.

***Note***

*CineWide requires the use of a 2.35:1 or similar aspect ratio superwide format screen.*

### Key Features and Benefits ➤

The RS-440 offers these key features and benefits:

- Native Resolution: 1280 x 720
- High-performance Digital Light Processing (DLP™) engine
- HDMI Input with High-bandwidth Digital Content Protection (HDCP)
- HDTV Compatible
- Brilliant Color™ provides enhanced primary and secondary color processing for more lifelike images

### Parts List ➤

Your RS-440 is shipped with the following items. If any items are missing or damaged, please contact your Runco dealer or Runco Customer Service at (800) 23-RUNCO.

- RS-440 DLP Projector
- Remote Control Unit and two (2), AAA-size batteries
- AC Power Cord (by country)
- HDMI to HDMI Cable
- Serial Communication Cable (D-sub 9-pin female to Mini-DIN 9-pin male), 5.9 in. (15 cm)
- Warranty information and registration card
- Runco RS-440 Installation/Operation Manual (this document)

**Optional Accessories:**

- CineWide™ technology (fixed, secondary anamorphic lens)
- Ceiling mount kit (part number 956-0092-00)

# 2. Controls and Functions

## 2.1 RS-440 at a Glance

Figure 2-1 shows the locations of key RS-440 components.

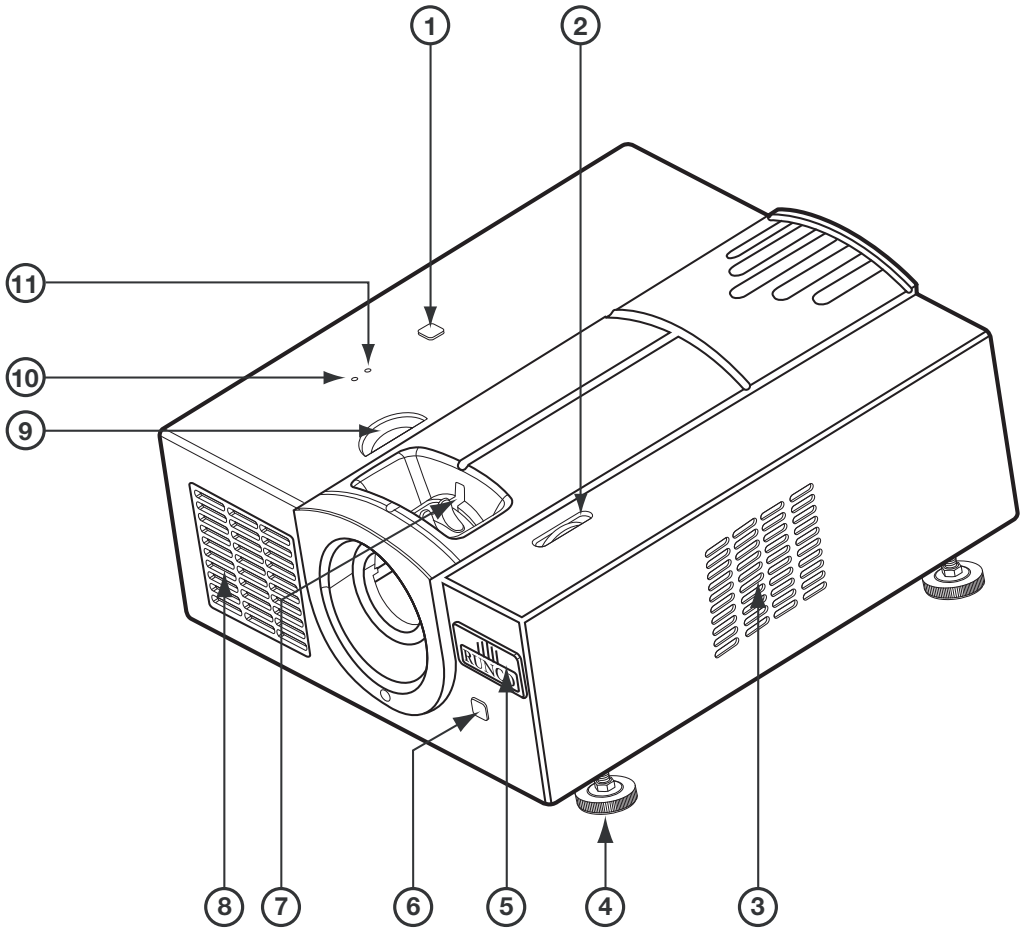



**Figure 2-1. RS-440 Front/Side/Top View**

1. **TOP IR SENSOR**
2. **VERTICAL LENS SHIFT DIAL**
   Shifts the image up or down.
3. **INTAKE VENT**
4. **ADJUSTABLE FEET**
   Use to adjust the height or projection angle.
5. **RUNCO LOGO**
   The logo can be rotated to match the projector orientation: inverted (ceiling-mounted) or upright. To rotate the logo, grip it at the sides, pull it away from the projector and rotate it 180 degrees.

6. **FRONT IR SENSOR**
7. **ZOOM/FOCUS RING**
   Use this to change the projected image size or focus the image.
8. **EXHAUST VENT**
9. **HORIZONTAL LENS SHIFT DIAL**
   Shifts the image left or right.
10. **TEMPERATURE INDICATOR**
    Flashes blue when the projector is overheated.
11. **POWER/STANDBY INDICATOR**
    Indicates power status as follows:
    - Lights solid blue when the projector is in standby mode
    - Off during normal operation
    - Flashes blue after the projector is turned off to indicate that the lamp is cooling down

## 2.2 RS-440 Rear Panel

Figure 2-2 shows the RS-440 rear panel.

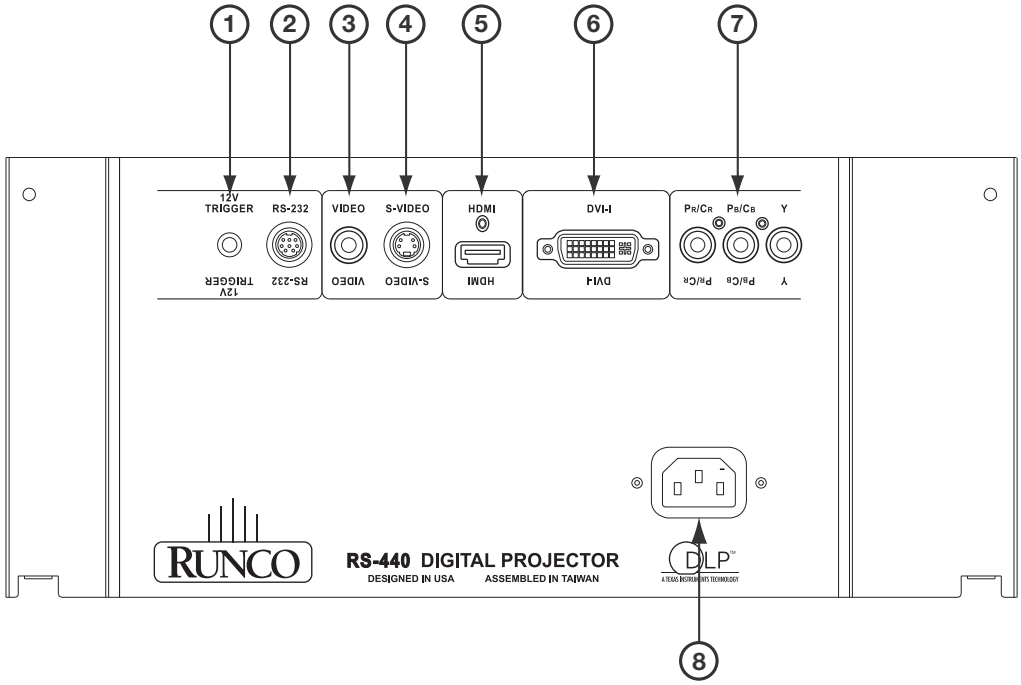



**Figure 2-2. RS-440 Rear Panel**

1. **12-VOLT (250 mA) TRIGGER OUTPUT (3.5-mm mini phono jack; Tip = +12V; Sleeve = Ground)**
   Connection for a retractable screen, screen mask or other, 12-volt trigger-activated device.
2. **RS-232 CONTROL PORT**
   A female, 9-pin mini-DIN connector for interfacing with a PC or home theater automation/control system.

3. **COMPOSITE VIDEO INPUT**
   Standard composite video input for connecting a VCR, laser disc player or other composite video source.
4. **S-VIDEO**
   A standard S-Video input for connecting a DVD player, satellite receiver or Super VHS (S-VHS) VCR.
5. **HDMI**
   HDCP-compliant digital video input for connecting a DVD player or HD tuner with a DVI or HDMI output.
6. **DVI-I (Analog/Digital)**
   Accepts either an HDCP-compliant, digital video input (DVI-D) or an RGB PC signal from a personal computer (DVI-A).
7. **COMPONENT VIDEO (RCA connectors)**
   Standard- or high-definition (480i/480p/576i/576p/720p/1080i/1080p) Component (YPrPb) input for connecting a DVD/HD-DVD/BD player, HD set-top box or other SD/HD source.

*For best results, do not run your DVD player in progressive mode.*

8. **POWER INPUT (100 to 240 VAC)**
   Connect the RS-440 to power here.

## 2.3 RS-440 Remote Control

Figure 2-3 shows the RS-440 remote control, and the paragraphs that follow describe its functionality.

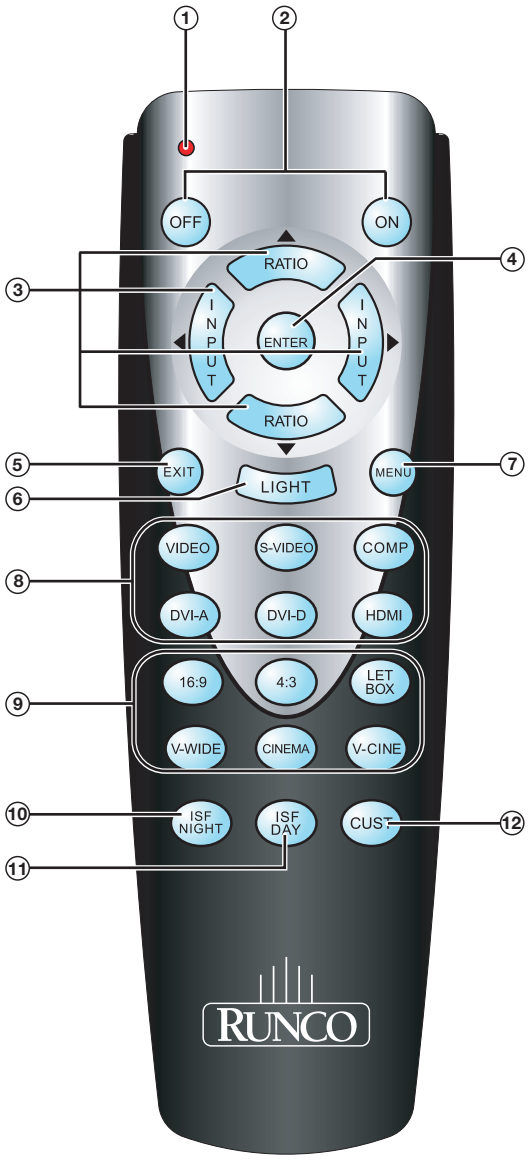



**Figure 2-3. RS-440 Remote Control**

1. **IR OUTPUT INDICATOR**
   Lights when a button is pressed to indicate that an IR signal is being transmitted.
2. **ON / OFF**
   Use these buttons to turn the projector on or off.
3. **Cursor Keys (▲, ◀, ▼, ▶)**
   Use these buttons to select items or settings, adjust settings or switch display patterns.

   When no menus are present on-screen, the **UP** and **DOWN** buttons toggle through the available aspect ratios. Likewise, the **LEFT** and **RIGHT** buttons toggle through the available source inputs.
4. **ENTER**
   Press to select a highlighted menu item or confirm a changed setting.
5. **EXIT**
   Press to exit the current menu and return to the previous one.
6. **LIGHT**
   Press to illuminate the remote control buttons.
7. **MENU**
   Press this button to show or hide the on-screen display (OSD) controls.
8. **Source Selection Buttons:**

   **VIDEO**
   Press to switch to the Composite video input.

   **S-VIDEO**
   Press to switch to the S-Video input.

   **COMP**
   Press to switch to the Component (480i/480p/576i/576p/720p/1080i/1080p) video input.

   **DVI-A**
   Press to switch to the DVI-A input.

   **DVI-D**
   Press to switch to the DVI-D input.

   **HDMI**
   Press to switch to the HDMI input.

9. **Aspect Ratio Selection Buttons**
   Use these buttons to select an aspect ratio directly, as follows:

   **16:9**
   For viewing 16:9 DVDs or HDTV programs in their native aspect ratio.

   **4:3**
   Scales the input signal to fit 4:3 display mode in the center of the screen.

   **LETBOX (Letterbox)**
   For viewing LaserDisc movies or non-anamorphic DVDs on a 16:9 screen.

   **V-WIDE (VirtualWide)**
   Enlarges a 4:3 image horizontally in a NON-linear fashion to fit 16:9 full screen display.

   **CINEMA**
   For viewing 2.35:1 source material.

   **V-CINE (Virtual Cinema – RS-440LT/CineWide only)**
   Selects the Virtual Cinema aspect ratio, used for viewing 16:9 source material on a 2.35:1 screen.

**Memory Preset Buttons:**

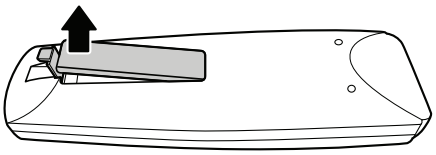
10. **ISF NIGHT**
    Press to recall settings for the current input from the “ISF Night” memory preset.
11. **ISF DAY**
    Press to recall settings for the current input from the “ISF Day” memory preset.
12. **CUST**
    Press to recall settings for the current input from the “Custom” memory preset.

# 3. Installation

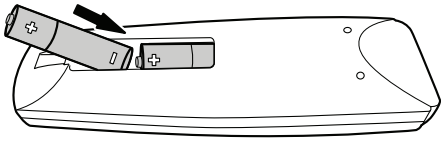
## 3.1 Remote Control

To install batteries in the remote control:

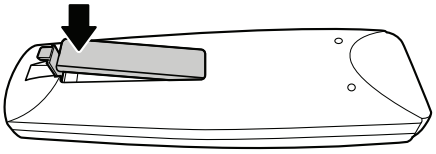
1. Press down the tab on the cover and pull the cover in the direction of the arrow.



2. Insert the included batteries. Ensure that the polarities correctly match the ⊕ and ⊖ markings inside the battery compartment.



3. Insert the lower tab of the cover into the opening, and press down the cover until it clicks in place.



➤ ***Notes on Batteries***

- Make sure that the battery polarities are correct when installing the batteries.
- Do not mix an old battery with a new one or different types of batteries.
- If you will not use the remote control for a long time, remove the batteries to avoid damage from battery leakage.

### Notes on Remote Control Operation ➤

The remote control can be used to control the projector within the ranges shown in Figure 3-1.

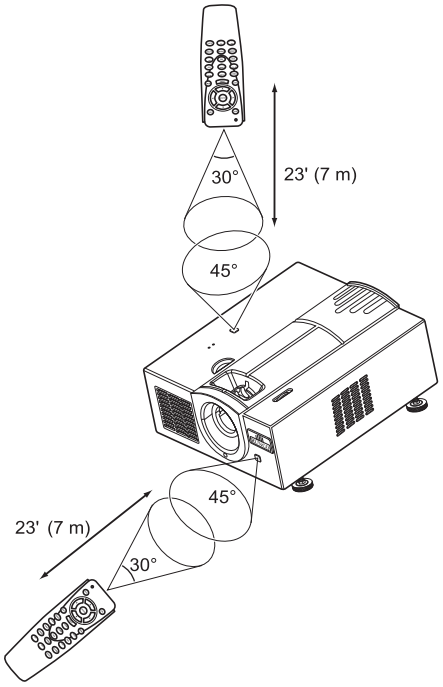



**Figure 3-1. Available Range of the Remote Control**

***Note*** *The signal from the remote control can be reflected by the screen or other surfaces.*

- For best results, hold the remote control within 23 feet (7m) of the back or top sensor and aligned within 30°.
- Do not drop the remote control or expose it to moisture or high temperature.
- The remote control may malfunction under a fluorescent lamp. If that occurs, move the projector away from the fluorescent lamp.
- Make sure that there is nothing obstructing the infrared beam between the remote control and the IR receiver on the projector.
- If the effective range of the remote control decreases, or it stops working, replace the batteries with new ones.
- Ambient conditions may possibly impede the operation of the remote control. If this happens, point the remote control at the projector, and repeat the operation.

## 3.2 Quick Setup

Table 3-1 gives a quick overview of the RS-440 installation process. The sections following this one provide detailed instructions.

***Note*** *Installation should be performed by a qualified custom video installation specialist.*

### Table 3-1. Installation Overview

| Step | Procedure | For Details, Refer to page... |
|---|---|---|
| 1 | Choose a location for the projector | 14 |
| 2 | **If installing an RS-440LT/CineWide:** Install CineWide lens base plate (optional) | 20 |
| 3 | Mount the projector | 22 |
| 4 | Connect signal sources to the RS-440 | 23 |
| 5 | Connect external controller to RS-232 port (optional) | 28 |
| 6 | Connect 12-volt trigger output to retractable screen or other, 12-volt trigger-activated equipment (optional) | 29 |
| 7 | Apply power to the projector | 29 |
| 8 | Change the OSD Language (optional) | 30 |
| 9 | For rear-screen and/or ceiling-mount installations, select the proper picture orientation | 30 |
| 10 | Primary lens adjustments: projected image size (zoom), position (shift) and focus | 17, 31 |
| 11 | Install CineWide anamorphic lens (optional) | 33 |
| 12 | CineWide lens adjustments: position, pitch (angle), geometry and focus | 33 |
| 13 | Projector calibration: adjust the following ***for each input***; save settings when finished:<br>Aspect ratio<br>Brightness<br>Contrast<br>Color level<br>Tint<br>Input position | 44 through 49 |

## 3.3 Installation Considerations

Proper installation of your projector will ensure the quality of your display. Whether you are installing a projector temporarily or permanently, you should take the following into account to ensure your projector performs optimally.

***Installation Type*** ➤

Choose the installation type that best suits your needs: front or rear screen, floor mount or inverted mount. Table 3-2 compares these various installation methods.

### Table 3-2. Projector Installation Options

| Advantages | Considerations |
|---|---|
| **Front Screen, Floor Mount Installation** | |
| • Easy to set up<br>• Can be moved or changed quickly<br>• Easy to access | • Shares floor space with audience |
| **Front Screen, Inverted Mount (ceiling) Installation** | |
| • Does not take up audience space<br>• Projector is unobtrusive<br>• Projector cannot be accidentally moved | • Installation is more permanent<br>• Projector access is more difficult |
| **Rear Screen, Floor Mount Installation** | |
| • Projector is completely hidden<br>• Projector is easily accessed<br>• Usually good ambient light rejection | • Requires separate room<br>• Installation cost is usually higher |
| **Rear Screen, Inverted Mount (ceiling) Installation** | |
| • Projector is completely hidden<br>• Usually good ambient light rejection | • Requires separate room<br>• Installation cost is usually higher |
| **Rear Screen, Floor Mount with Mirror** | |
| • Projector is completely hidden<br>• Usually good ambient light rejection<br>• Requires less space behind screen than other rear screen installations | • Requires separate room<br>• Installation cost is usually higher |

***Ambient Light*** ➤

In general, minimize or eliminate light sources directed at the screen. Contrast ratio in your images will be noticeably reduced if light directly strikes the screen, such as when a shaft of light from a window or floodlight falls on the image. Images may then appear washed out and less vibrant.

## ➤ *Throw Distance*

Throw distance is the distance measured from the front of the projector to the screen. This is an important calculation in any projector installation as it determines whether or not you have enough room to install your projector with a desired screen size and if your image will be the right size for your screen.

You can quickly estimate the throw distance by taking the width of the screen and multiplying it by the lens throw ratio; see Figure 3-2. The result of this calculation tells you roughly how far back the projector should be positioned from the screen in order to project a focused image large enough to fill the screen.

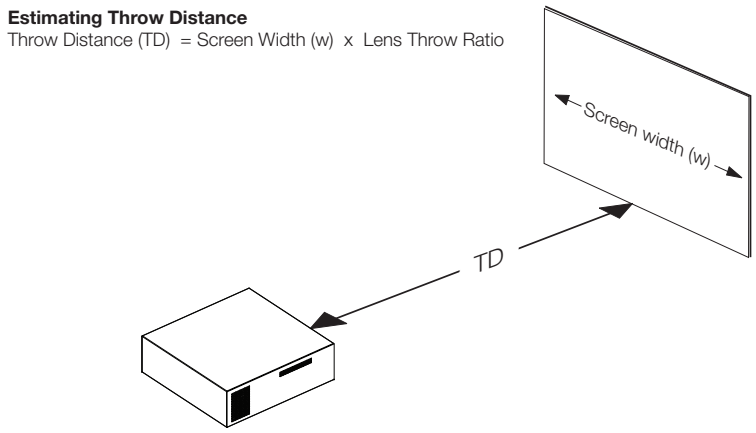



**Figure 3-2. Estimating Throw Distance**

Table 3-3 gives the throw ratios for the RS-440 Series.

### Table 3-3. Throw Ratios for the RS-440 Series

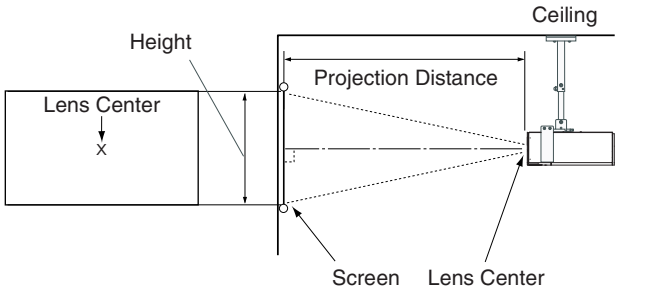
| Projector Model | Throw Ratio with Primary Lens Only | Throw Range in inches, with 72.6x40.8-inch (1.78:1) Screen | | Throw Ratio with Primary Lens and Anamorphic Lens | Throw Range in inches, with 96x40.8-inch (2.35:1) Screen | |
|---|---|---|---|---|---|---|
| | | Minimum | Maximum | | Minimum | Maximum |
| RS-440 | 1.36 - 1.70 | 98.74 | 123.42 | (n/a) | | |
| RS-440LT | 1.69 - 2.13 | 122.69 | 154.63 | (n/a) | | |
| RS-440LT/CineWide | (n/a) | | | 1.69 - 2.13 | 162.24 | 204.48 |

### Vertical and Horizontal Position ➤

Proper placement of the projector relative to the screen will yield a rectangular, perfectly-centered image that completely fills the screen.

Typically (but not always), the projector is positioned perpendicular to the screen and in such a way that the lens center and screen center are aligned with each other, as shown in Figure 3-3.

**Ceiling Installation**




**Floor Installation**

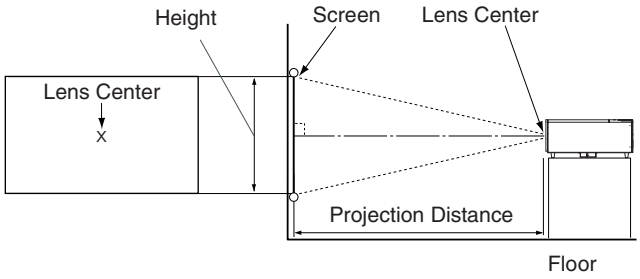
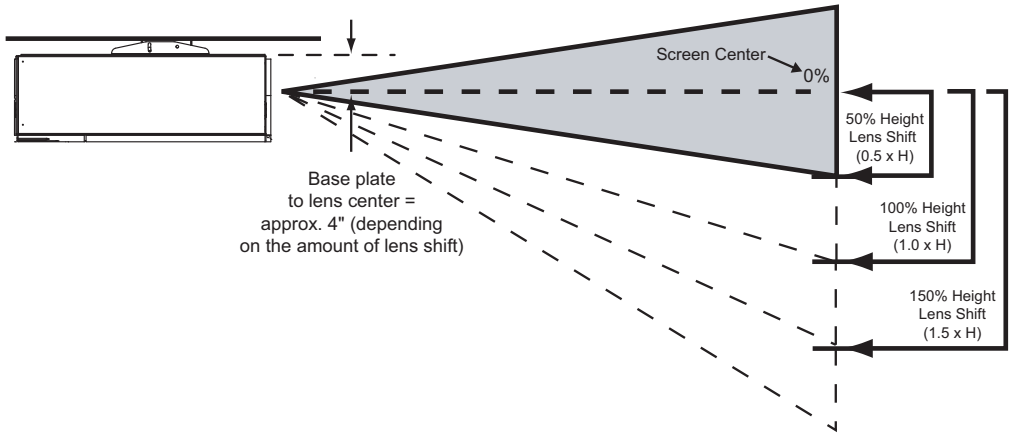



**Figure 3-3. Projector Placement**

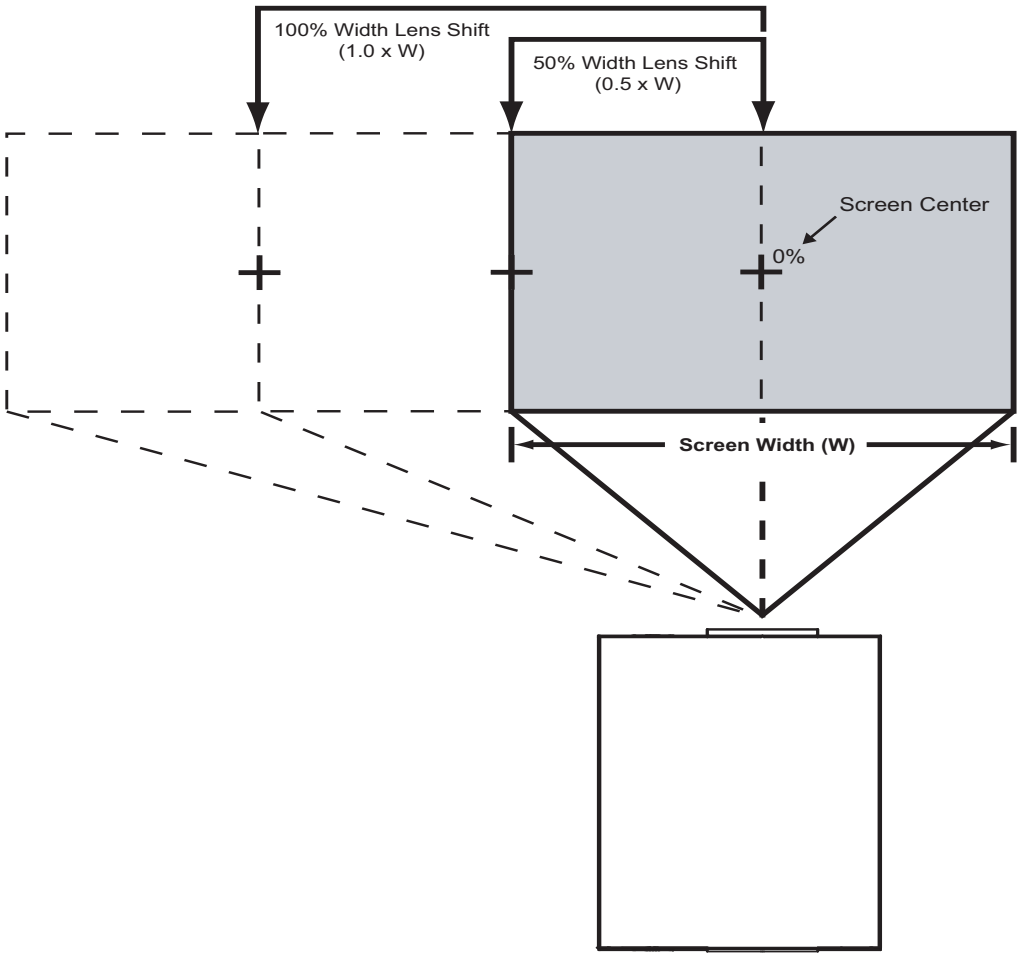
### ➤ *Vertical and Horizontal Lens Shift*

If it is not possible to align the projector and screen as shown in Figure 3-3, you can use the lens shift controls to center the image on the screen. Lens shift is generally expressed as a percentage of the screen height or width, as shown in Figure 3-4 and Figure 3-5.




***Note:*** *This is a general example of lens shift. Lenses vary in their shift capabilities.* ***No particular lens or projector is shown in this example.***

**Figure 3-4. Vertical Lens Shift (Example only)**




***Note:*** *This is a general example of lens shift. Lenses vary in their shift capabilities.* ***No particular lens or projector is shown in this example.***

**Figure 3-5. Horizontal Lens Shift (Example only)**

Table 3-4 gives the lens shift limits for the RS-440, as percentages and absolute measurements with a 96 x 54 inch (1.78:1) screen.

### Table 3-4. Vertical and Horizontal Lens Shift Limits

| | | RS-440 | RS-440LT |
|---|---|---|---|
| **Lens Shift Limits, as Percentages of Screen Height or Width (Notes 1 and 2)** | | | |
| Vertical (Notes 2 and 3) | Up | 50% | 50% |
| | Down | 55% | 75% |
| Horizontal (Note 2) | Left | 7.5% | |
| | Right | 7.5% | |
| **Lens Shift Limits in Inches, with a 96-by-54 inch (1.78:1) Screen** | | | |
| Vertical | Up | 27.00 | 27.00 |
| | Down | 29.70 | 40.50 |
| Horizontal | Left | 7.20 | |
| | Right | 7.20 | |

***Notes:***

1. *With no vertical or horizontal lens shift, the lens center and screen center are aligned with each other.*
2. *Vertical shift limits are percentages of the screen height. Horizontal shift limits are percentages of the screen width.*
3. ***Vertical lens shift figures apply to ceiling mount configurations.*** *For floor installations (where the projector is upright), reverse the up/down vertical offset percentages.*

◄ ***Folded Optics***

In rear-screen applications where space behind the projector is limited, a mirror may be used to fold the optical path, as shown in Figure 3-6. The position of the projector and mirror must be accurately set. If you are considering this type of installation, contact your dealer for assistance.

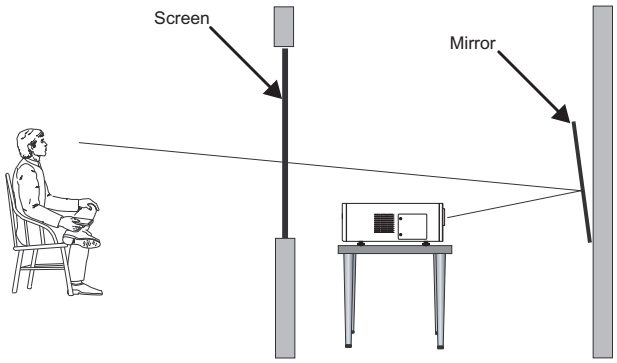



**Figure 3-6. Folded Optics**

***Other Considerations*** ➤

Other considerations and tips that can help improve your installation:

- Keep the ambient temperature constant and below 35°C (95°F). Keep the projector away from heating and/or air conditioning vents. Changes in temperature may cause drifts in the projector circuitry, which may affect performance.
- Keep the projector away from devices that radiate electromagnetic energy such as motors and transformers. Common sources of these include slide projectors, speakers, power amplifiers and elevators.

## 3.4 Installing the Optional CineWide Lens Base Plate

If you are installing an RS-440LT/CineWide, proceed as follows to install the CineWide anamorphic lens base plate. Otherwise, skip this step and proceed with ***Mounting the RS-440*** (page 22).

***Note***

1. *Do not install the CineWide lens yet, only the fixed CineWide base plate. You will install the CineWide lens after you install the projector and adjust the primary lens.*
2. *Some components shipped with your projector may differ slightly from what is shown in these instructions.*

To install the fixed CineWide base plate on an RS-440LT/CineWide:

1. Place the projector upside down on a blanket or other soft surface.
2. Line up the three mounting holes on the CineWide base plate with those on the bottom of the projector.
3. **If you are mounting the RS-440LT/CineWide on a ceiling:** Line up the three holes on the projector ceiling mounting plate (included with the projector ceiling mount kit) with those on the bottom of the projector.
4. Secure the CineWide base plate (and ceiling mounting plate, if needed) to the projector with the M4x14mm screws provided with the CineWide lens base plate. See Figure 3-7.

***Caution***

1. ***Do not use the mounting screws provided with the ceiling mount kit.*** *Use only the hardware provided with the CineWide lens base plate.*
2. *DO NOT OVER-TIGHTEN THE SCREWS.*

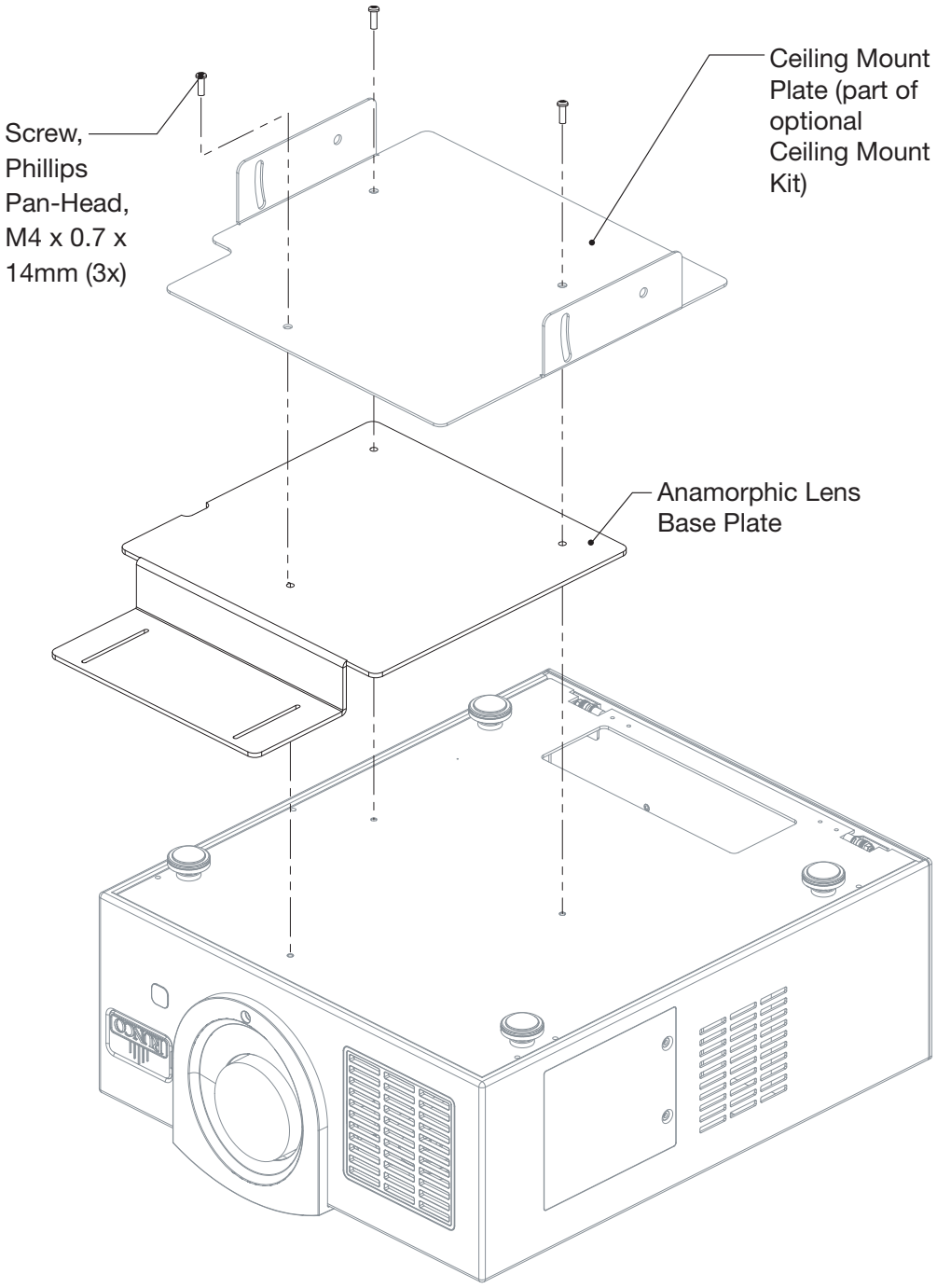



**Figure 3-7. RS-440LT/CineWide with Lens Base Plate and Ceiling Mounting Plate - Exploded View**

## 3.5 Mounting the RS-440

There are several methods for mounting the projector. Depending on your chosen installation, one method may be more suitable than another.

***Floor Mounting (Upright)*** ➤

In typical front and rear screen installations, the projector can be mounted to a secure and level surface such as a table or cart. Carts are useful when moving a projector during a presentation or from site to site. If possible, lock the wheels when it's in position to prevent it from being moved during a presentation.

***Ceiling Mounting (Inverted)*** ➤

For fixed installations, and for those that want the projector out of sight or have a limited space for projector and audience, you can invert the RS-440 and suspend it from the ceiling using a specially-designed ceiling mount fixture.

***Note***

*Use only the Runco-approved ceiling mount kit designed for your projector. Install the mount kit according to the instructions provided with it.*

The projector can also be inverted and placed in an enclosure above and behind the viewing area. Install four feet on the inside bottom surface of the enclosure on which the projector can rest. A variety of materials can be used for this purpose (for example, rubber crutch tips or turntable feet).

***Adjusting the Projector Height or Projection Angle*** ➤

When the RS-440 is installed upright, you can adjust the projector height or projection angle by turning the four adjustable feet on the bottom of the projector; see Figure 3-8. This is useful for correcting the angle of projection when the projector is placed on an uneven surface or when the screen is at an angle. You can tilt the projector up to five (5) degrees up or down by adjusting the feet.

The feet are connected to threaded bolts; turn them clockwise to raise the projector or counterclockwise to lower it.

***Note***

*Tilting the projector may cause keystone distortion. To correct this, refer to* ***Installation*** *on page 47.*

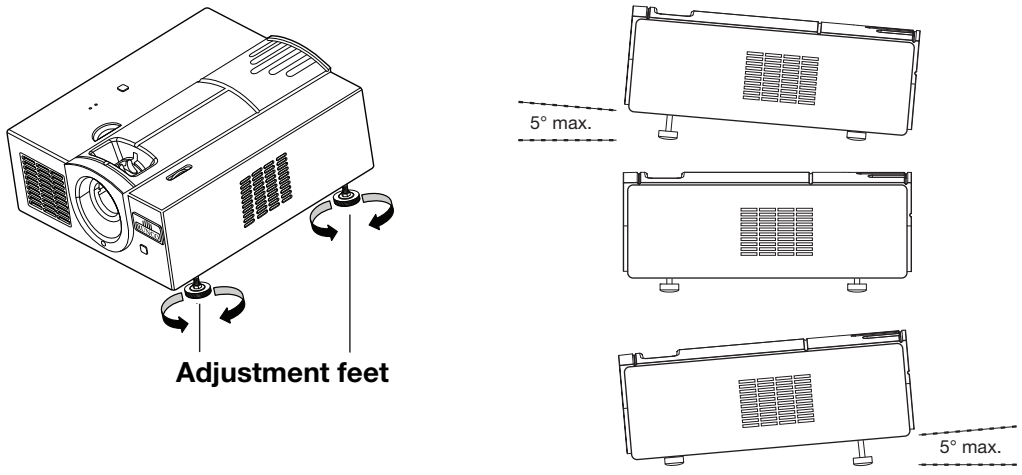



**Figure 3-8. Adjusting the Feet**

## 3.6 Connections to the RS-440

Proceed as follows to connect the RS-440 to your video sources, external controller(s) – if present – and AC power.

When connecting your equipment:

- Turn off all equipment before making any connections.
- Use the correct signal cables for each source.
- Ensure that the cables are securely connected. Tighten the thumbscrews on connectors that have them.

To access the connector panel, pull firmly on the cable access cover to open it.

➤ ***Connector Panel Access***

Connect your video sources to the RS-440 as shown and described in the sections that follow.

➤ ***Connecting Source Components to the RS-440***

**HDMI/DVI Connections:** See Figure 3-9.

***Tip***

*Use the HDMI input whenever possible. This ensures the highest video quality because the signal is carried in the digital domain throughout the entire signal path, from source component output into the projector.*

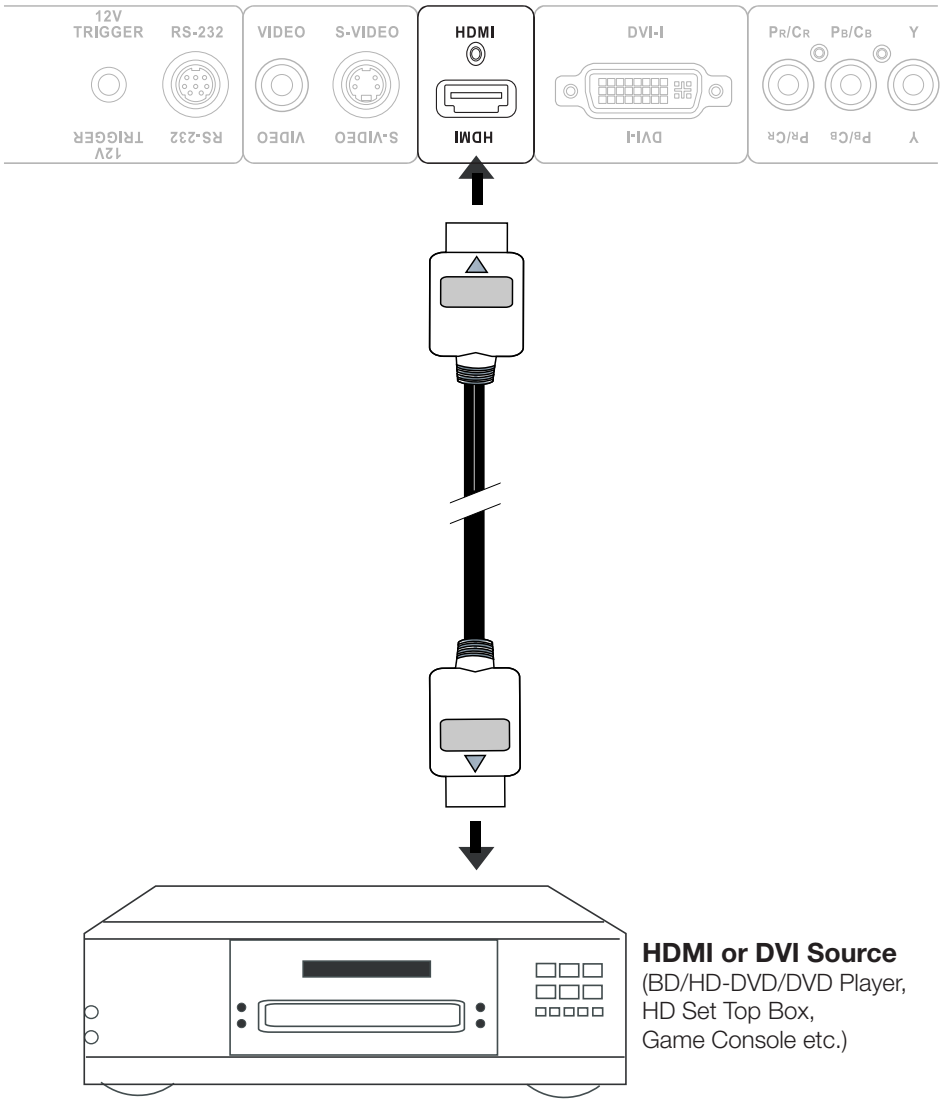



**Figure 3-9. HDMI/DVI Source Connections**

**RGB Connections:** Connect your personal computer or other RGB source (DVD player or HD set top box) to the **DVI-I** input; see Figure 3-10.

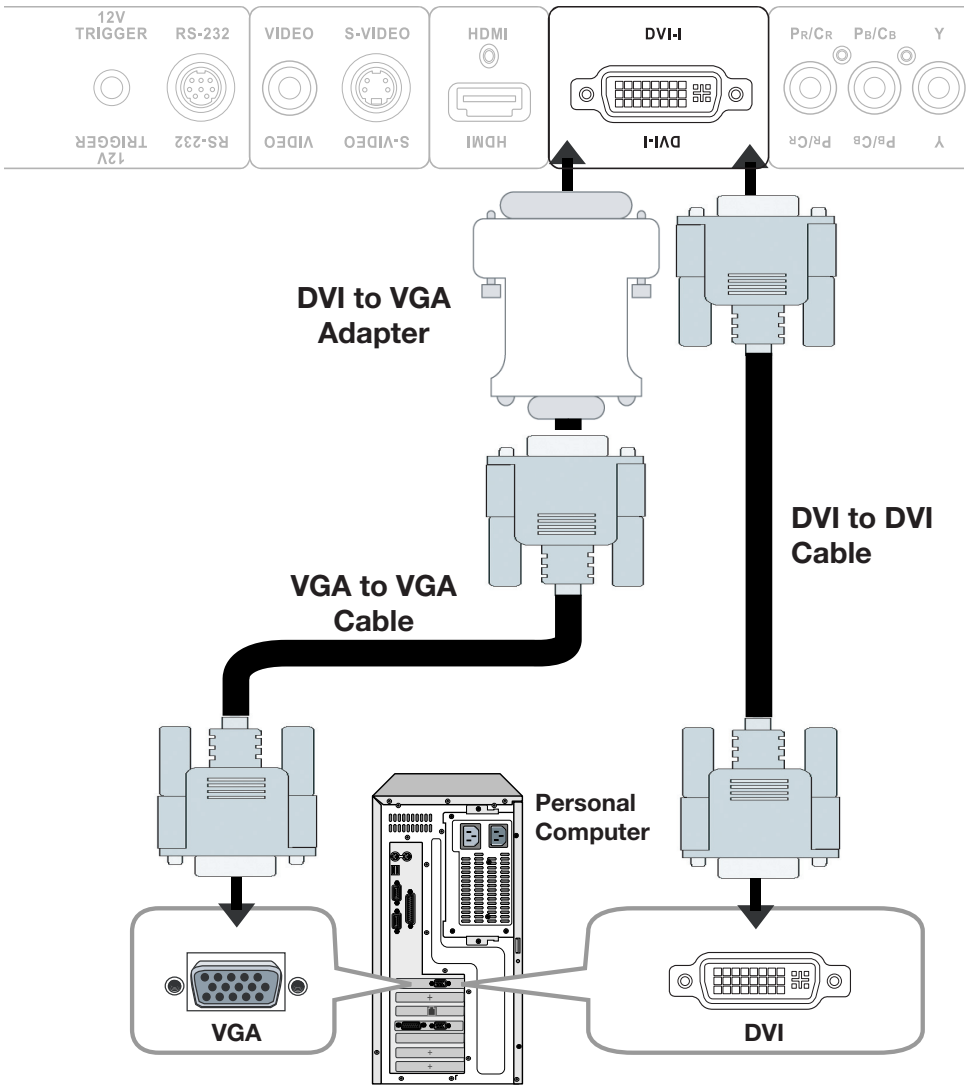



**Figure 3-10. RGB Connections**

***Note***

1. *Refer to **Computer Signal Compatibility** on page 67 for a list of computer signals compatible with the RS-440. Use with signals other than those listed may cause some functions not to work.*
2. *Some Macintosh computers may require a Macintosh video adapter. Contact your nearest authorized service center or dealer.*
3. *This RS-440 may not be able to display images from notebook computers in simultaneous (CRT/LCD) mode. Should this occur, switch the notebook computer to "CRT only" mode. If you are unsure how to do this, refer to your notebook computer's user manual.*

**Component Video Connections:** Connect your component video source (DVD player or HD set top box) to the **COMP** input as shown in Figure 3-11.

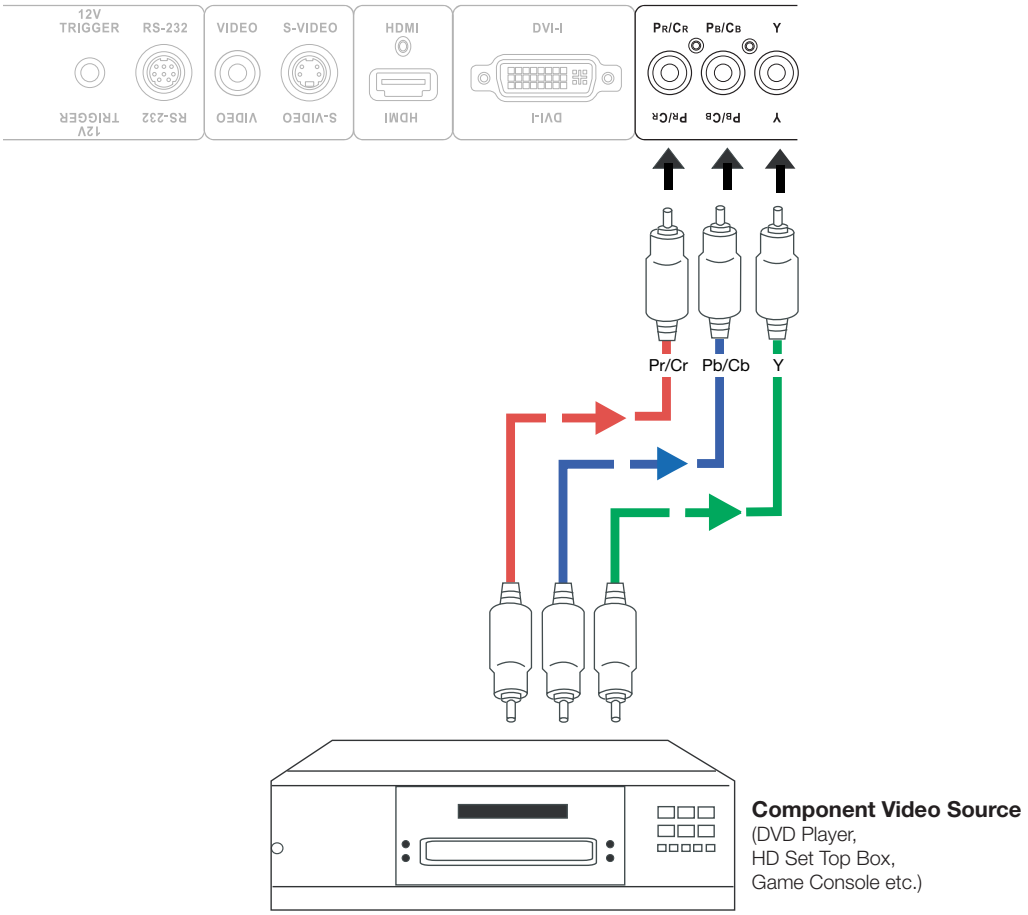



**Figure 3-11. Component Video Connections**

**S-Video/Composite Video Connections:** Connect your S-Video and composite video sources to the RS-440 as shown in Figure 3-12.

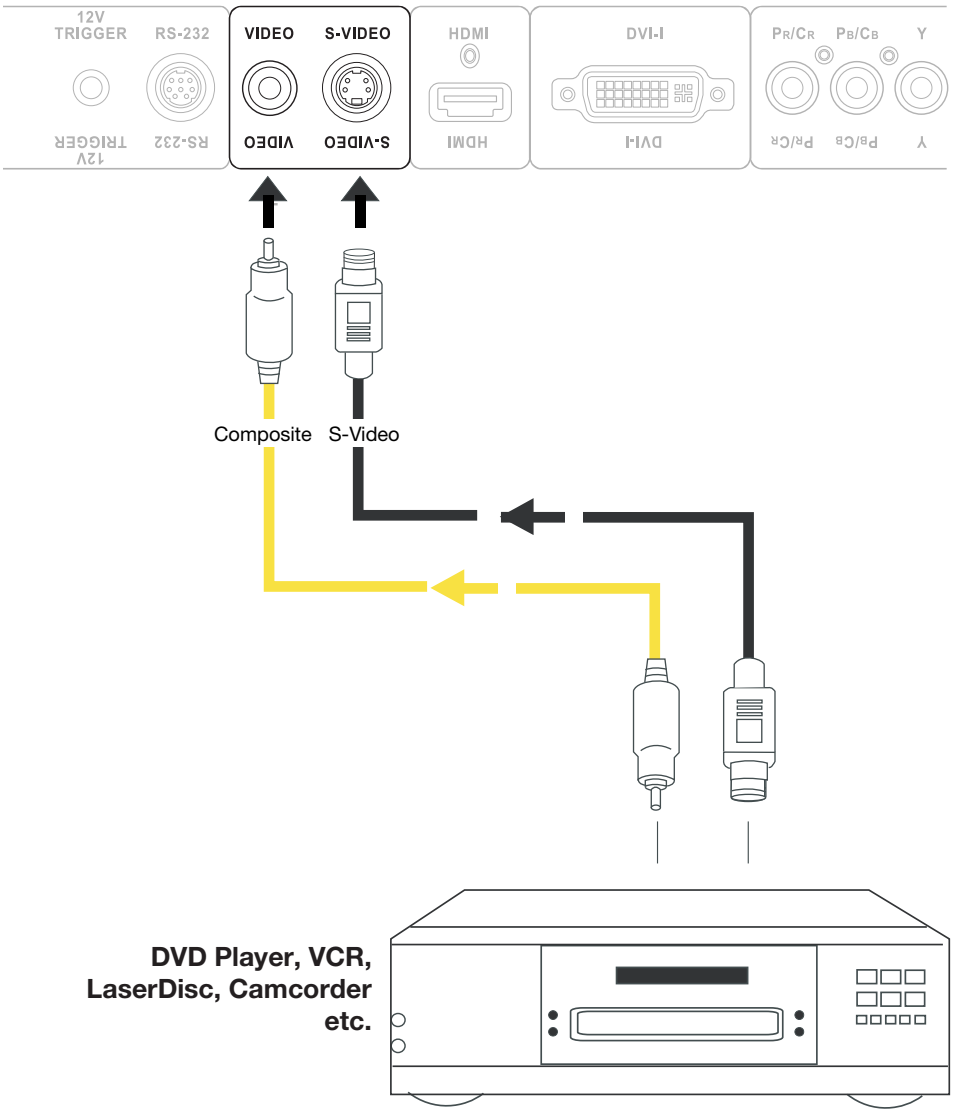



**Figure 3-12. Composite and S-Video Connections**

### *RS-232 Controller Connection* ➤

Use the communication cable supplied with the projector to connect a PC or home theater control/automation system (if present) to the RS-232 port on the RS-440; see Figure 3-13.

For more information about using this connection, refer to ***Serial Communications*** on page 61.

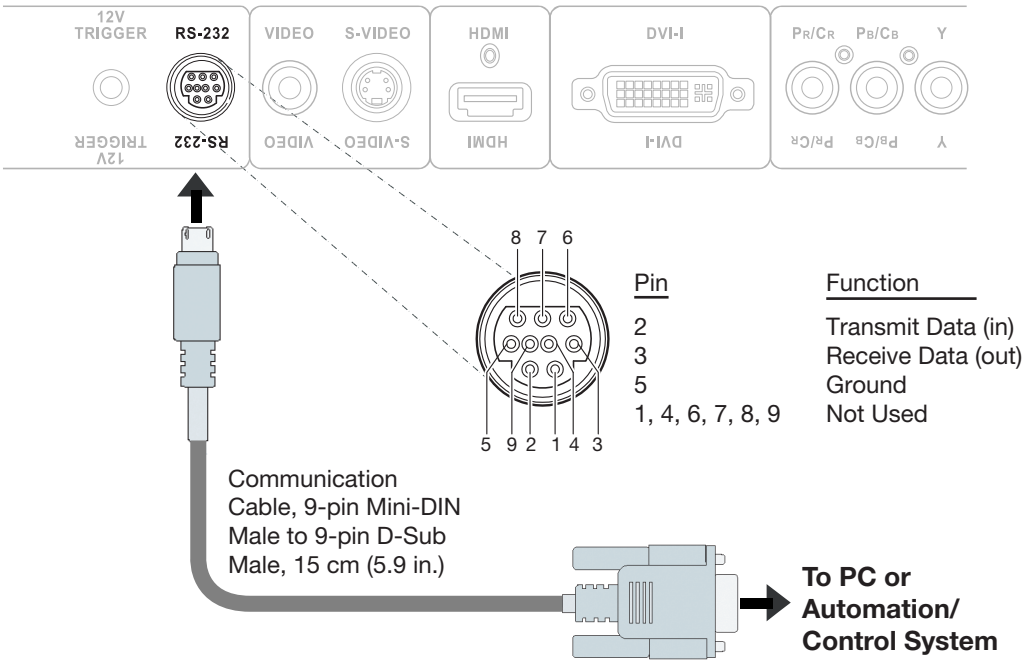



**Figure 3-13. RS-232 Control System Connection**

### ➤ *Connecting 12-Volt Trigger Output to External Theater Equipment*

If your home theater contains a retractable screen, screen mask or other 12-volt trigger-activated equipment, connect it to the 12-volt trigger output as shown in Figure 3-14.

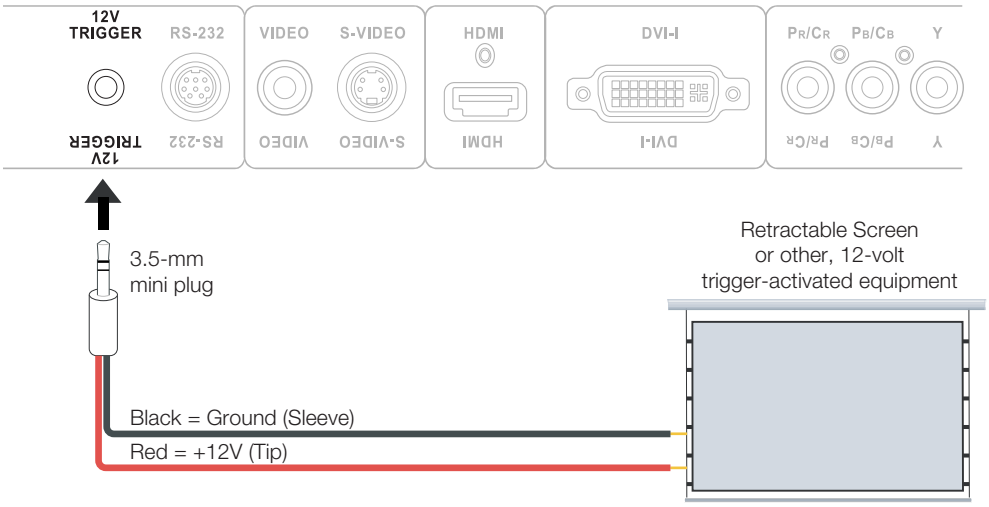
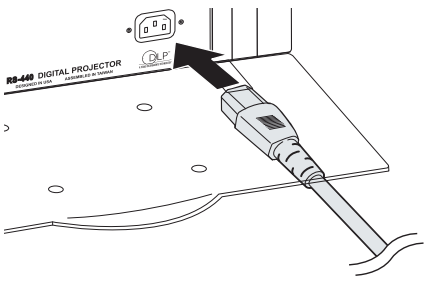



**Figure 3-14. Connecting the 12-Volt Trigger Output to Other Equipment**

## 3.7 Turning on the Power




1. Turn on your source components.
2. Plug the female end of the power cord into the AC receptacle on the rear of the RS-440 (AC 100V ~ 240V). (The RS-440 ships with various types of AC power cords. Choose the one that is appropriate to your locale.)
3. Connect the other end to your AC power source. The power indicator lights blue to indicate that the RS-440 is in “standby” mode.
4. Press the **ON** button on the remote control to turn on the projector. The power indicator turns off.
5. After a brief warm-up period (approximately 10 seconds), the RS-440 will start projecting.

## 3.8 Changing the OSD Language

The RS-440 OSD language is initially set to English, but can also display the menus in French, Spanish, Italian or German. To change the OSD language:

1. Press **MENU**.
2. Select **Installation** from the Main Menu and press **ENTER**.
3. Select **Language** from the Installation Menu and press **ENTER**.
4. Press ▲ or ▼ to highlight the desired language and press **ENTER**.

## 3.9 Adjusting the Picture Orientation

By default, the RS-440 is configured for a “floor/front” installation, in which the projector is installed upright and in front of the screen. If it is installed behind the screen and/or mounted on a ceiling, you must change the picture orientation. To do this:

1. Press **MENU** on the remote control.
2. Select Installation from the Main Menu and press **ENTER**.
3. Select Orientation from the Installation Menu and press **ENTER**.
4. Choose Floor Rear, Ceiling Front or Ceiling Rear to match the installation method.

## 3.10 Primary Lens Adjustments

➤ ***Focus and Zoom***

The RS-440 gives you a great deal of control over the picture size, position and focus. Figure 3-15 shows the location of the focus and zoom controls; Figure 3-16 shows the location of the lens shift controls.

To focus the projected image, rotate the focus ring left or right.

To make the picture larger (zoom in), rotate the zoom ring to the left (toward the Runco logo). To make the picture smaller (zoom out), rotate the zoom ring in the other direction.

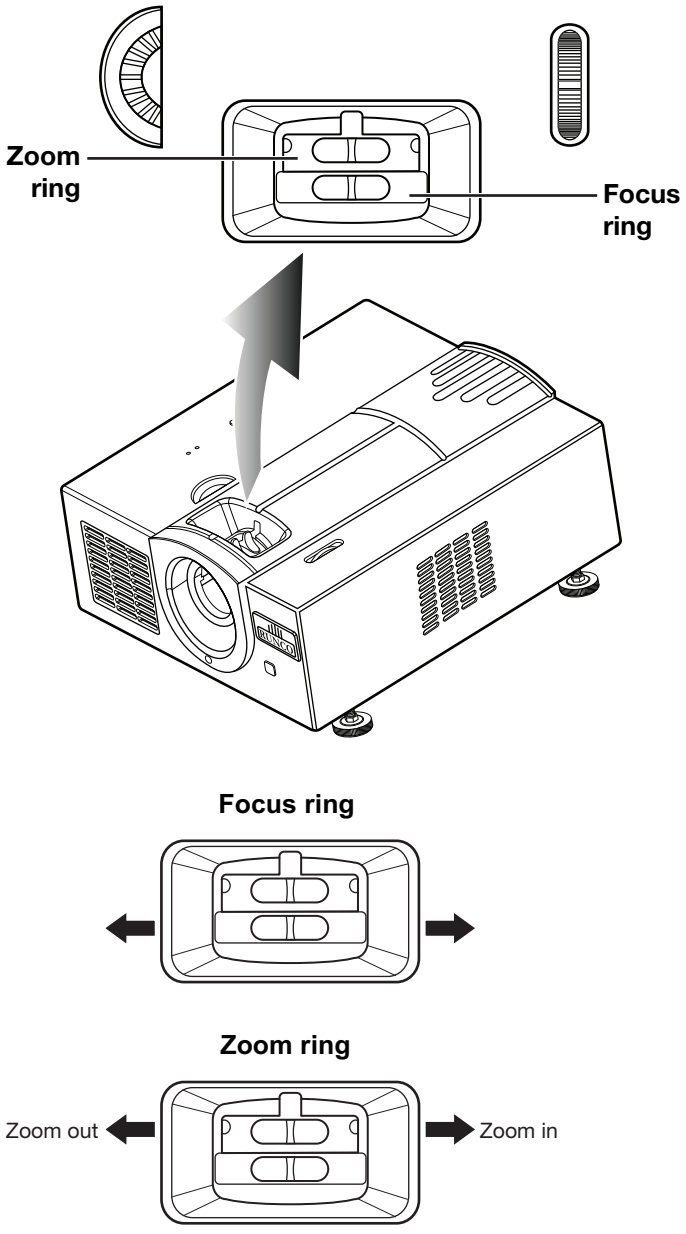



**Figure 3-15. Focus and Zoom Controls**

***Shift*** ➤ To change the projected image position, rotate the vertical and/or horizontal lens shift dials.

***Caution*** *Do not force the lens shift dials beyond their respective ranges. This may cause the projector to malfunction.*

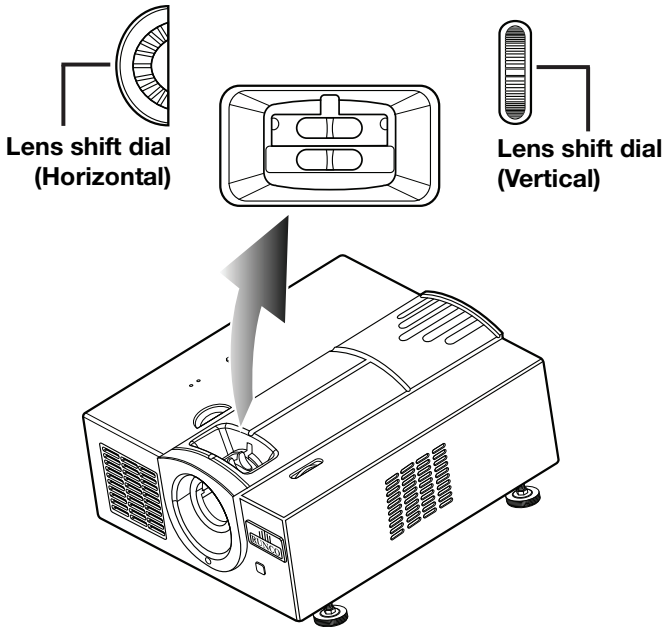



**Figure 3-16. Vertical and Horizontal Lens Shift Controls**

## 3.11 Installing and Adjusting the CineWide Anamorphic Lens

If you are installing an RS-440LT/CineWide, proceed as follows to install and adjust the anamorphic lens.

***Note*** ***It is extremely important that the primary lens is properly adjusted before you install the anamorphic lens. Ensure that the image from the primary lens is perfectly centered on the screen.***

The CineWide anamorphic lens mount kit consists of everything shown in Figure 3-17. Some components shipped with your projector may differ slightly from what is shown in these instructions.

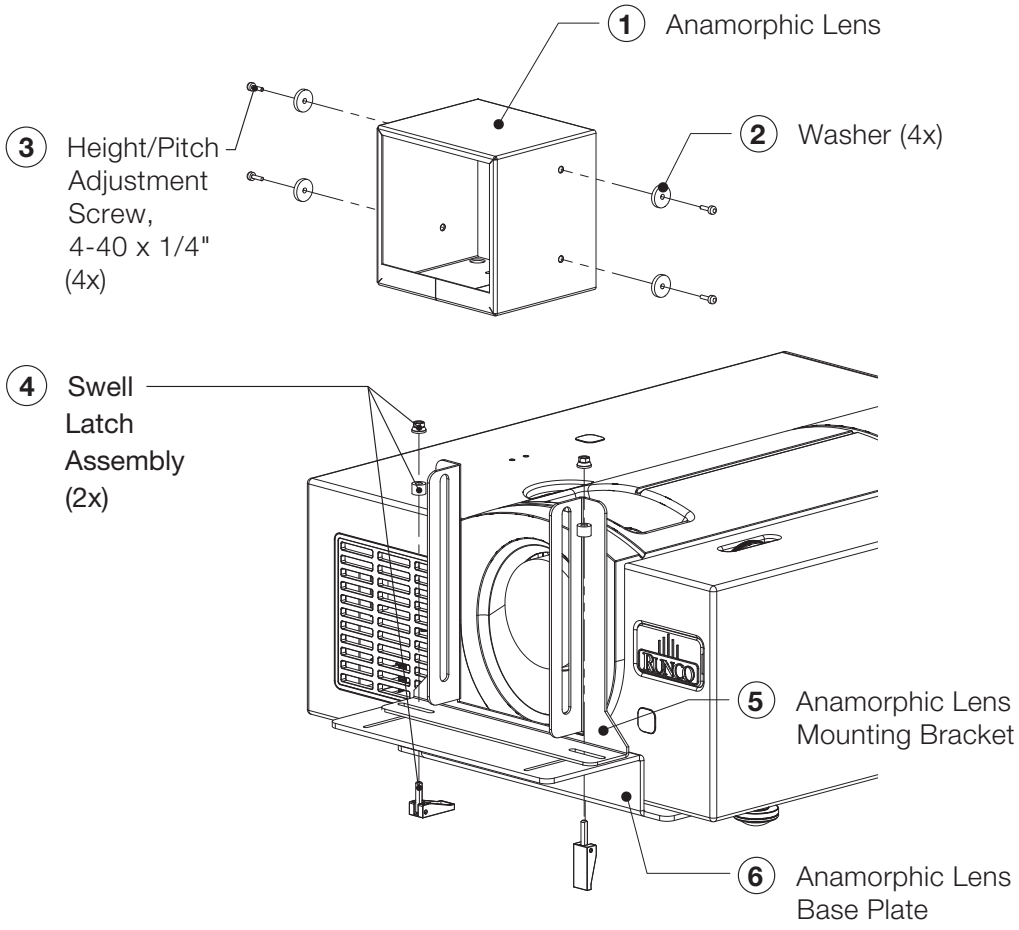
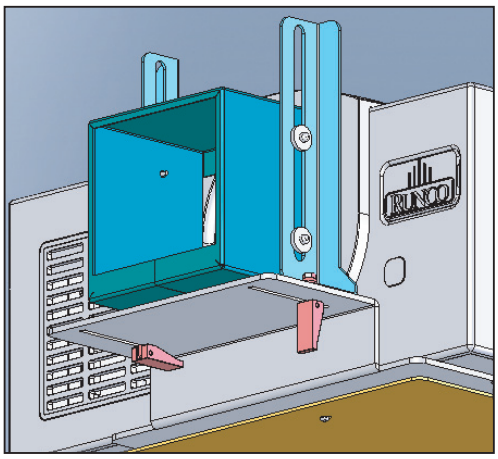



**Figure 3-17. Anamorphic Lens Mounting Assembly - Exploded View**

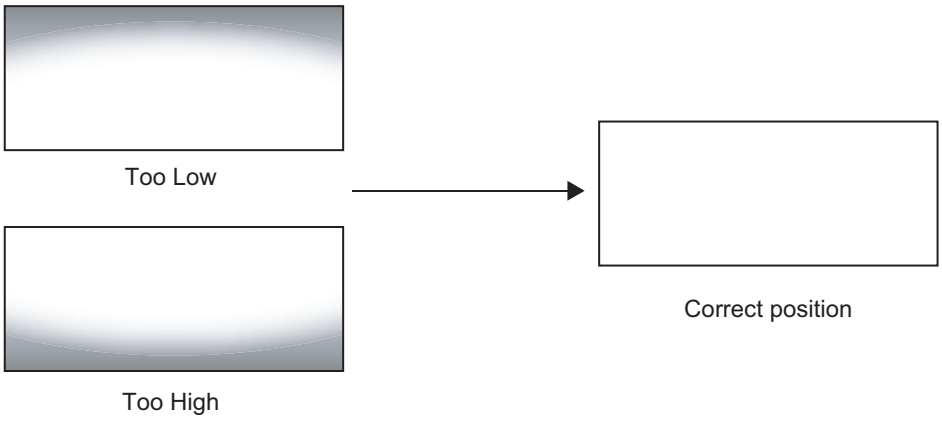
1. Use the Height/Pitch Adjustment Screws (**2**) and Washers (**3**) to attach the Lens Mounting Bracket (**5**) to the Anamorphic Lens (**1**).
2. Remove the nut and rubber collar from each Swell Latch Assembly (**4**).
3. Secure the lens (with the mounting bracket attached) to the Lens Base Plate (**6**) using the swell latches.



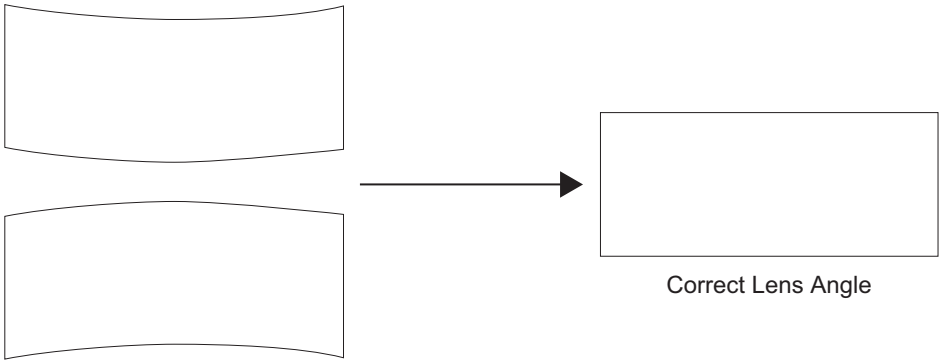
***Tip*** *To avoid clipping the corners of the image, position the anamorphic lens as close as possible to the primary lens.*

**Adjusting the Lens Height and Angle:**

1. Project a white field on the screen.
2. Loosen the four Height/Pitch Adjustment Screws just enough to allow vertical movement of the lens assembly.
3. Slowly move the anamorphic lens into place so that there are no shadows on the top or bottom of the screen:



4. Then, adjust the anamorphic lens angle so that the projected image is rectangular:




   The anamorphic lens will almost always be angled with respect to the projector; this is normal.

5. When the height and angle are properly set, tighten the Height/Pitch Adjustment Screws to secure the lens in place.

**Note** *There may be some pincushion distortion even after the lens is properly adjusted, especially at shorter throw distances. If this is the case, Runco recommends that you slightly over-scan the image into the screen frame area to mask the distortion.*

## Notes:

# 4. Operation

## 4.1 Using the On-Screen Menus

- Press the **MENU** button on the remote control to display the Main Menu. To select a menu item, use the ▲ and ▼ buttons on the remote control to highlight it. Press **ENTER** to confirm your selection.
- Use the arrow buttons to select menu items or change settings.
- Press **EXIT** to return to the previous menu.
- Press **MENU** to turn off the OSD menu. (When the Main Menu is displayed, pressing **EXIT** also turns off the menu.)

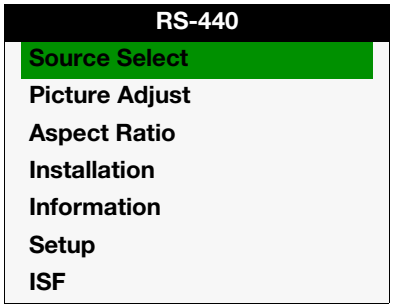
The RS-440 OSD menus are arranged hierarchically, as shown in Figure 4-1. Depending on the selected input source and signal characteristics, some menu options may not be available.

| | | |
|---|---|---|
| **Source Select** | Video | |
| | S-Video | |
| | Component | |
| | HDMI | |
| | DVI-D | |
| | DVI-A | |
| **Picture Adjust** | Picture Memory | ISF Night, ISF Day or Custom |
| | Brightness | |
| | Contrast | |
| | Color | |
| | Tint | |
| | Sharpness | 0 ... 6 |
| | Gamma | 1.5, 1.8, 2.0, 2.2, 2.35, 2.5 |
| | Color Temp. | 5400 K, 6500 K, 7500 K or 8500K |
| | Color Space | Auto, HDTV, SDTV, RGB-Video or RGB-PC |
| | BrilliantColor™ | On or Off |
| | Black Level | 0 IRE or 7 IRE |
| | Save Settings | |
| | Reset to Defaults | |
| **Aspect Ratio** | 16:9 | |
| | 4:3 | |
| | Letterbox | |
| | Virtual Wide | |
| | Cinema | |
| | Virtual Cinema | (RS-440LT/CineWide only) |
| **Installation** | Language | English, French, Spanish, German or Italian |
| | Orientation | Floor Front, Floor Rear, Ceiling Front or Ceiling Rear |
| | Keystone | V. Keystone |
| | | H. Keystone |
| | Overscan | Overscan Type |
| | | Overscan Adjust (0 ... 5) |
| | YUV/RGB Adjust (Component and DVI-A signals only) | H. Position |
| | | V. Position |
| | | Clock |
| | | Phase |
| | | Reset |
| | OSD Timeout | 0, 5, 15 or 60 sec. |
| | Vertical Correction (RS-440LT/CineWide only) | |

| | | |
|---|---|---|
| **Information** | Source | (read only) |
| | Resolution | |
| | H. Frequency | |
| | V. Frequency | |
| | Aspect Ratio | |
| | Picture Memory | |
| | Lamp Hours | |
| | Firmware | |
| | Serial | |
| **Setup** | Lamp Power | 180W or 230W |
| | Lamp Reset | |
| | Sync Threshold (Component input only) | |
| | Source Select | Auto or Manual |
| | Film Mode | Auto or Off |
| | DNR | |
| | Background Color | Black or Blue |
| | 12V Trigger | Normal or CineWide |
| | Factory Reset | Yes / No |
| **ISF** | Picture Memory | ISF Night, ISF Day or Custom |
| | Brightness | |
| | Contrast | |
| | Color | |
| | Tint | |
| | Sharpness | 0 ... 6 |
| | Gamma | 1.5, 1.8, 2.0, 2.2, 2.35, 2.5 |
| | Color Temp. | 5400 K, 6500 K, 7500 K or 8500K |
| | BrilliantColor™ | On or Off |
| | Black Level | 0 IRE or 7 IRE |
| | White Balance | R/G/B Gain |
| | | R/G/B Offset |
| | DNR | 0 ... 16 |
| | Save Settings | |
| | Blue Image | On or Off |
| | Splash Screen Timer | 0, 5, 15 or 60 sec. |
| | Reset to Defaults | |

**Figure 4-1. RS-440 OSD Menu Structure**

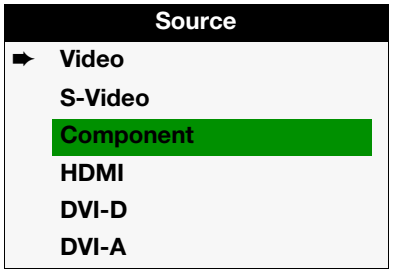
***Main Menu*** ➤ The Main Menu is the starting point for accessing all projector functions. (You must enter a passcode to access the ISF menu.)



Choose Source Select from the Main Menu to switch video sources.

The active source is indicated by an arrow to its left; in this example, Video is the active source. To select a different source, use the ▲ or ▼ button to highlight it and press **ENTER**.

### ◄ *Source Select*




Use the controls in the Picture Adjust menu to calibrate your RS-440 for optimum picture quality. To access the Picture Adjust menu, press **MENU**, highlight Picture Adjust and press **ENTER**.

To adjust a setting, use the ▲ or ▼ button to highlight it and press **ENTER**. Use the ◄ or ► button to change the setting. When finished, press **EXIT**.

The RS-440 has been designed to incorporate setup and calibration standards established by the Imaging Science Foundation (ISF). The ISF has developed carefully crafted, industry-recognized standards for optimal video performance and has implemented a training program for technicians and installers to use these standards to obtain optimal picture quality from Runco video display devices. Accordingly, Runco recommends that setup and calibration be performed by an ISF certified installation technician.

All signal types require separate processing. Therefore, you need to calibrate each input separately.

Although it may be possible to obtain satisfactory picture quality using the naked eye and regular program material, Runco recommends using the following calibration tools for best results:

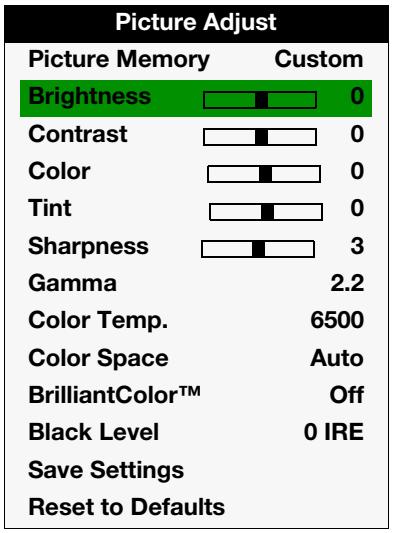
- External test pattern source – Ovation Multimedia, Digital Video Essentials or AVIA test DVD or equivalent.
- A blue filter (provided with many test DVDs), for color level and tint adjustments.

Connect your test pattern source to the input that you are calibrating and proceed as follows. **Perform the adjustments in the order listed here.**

**Picture Memory:** For each input, the RS-440 lets you store picture quality settings as presets that you can recall at a later time. You can create up to three presets per input and resolution, to accommodate changing lighting conditions or viewer preferences.

To recall a picture memory preset, highlight Picture Memory in the Picture Adjust menu and press **ENTER**. Then, press ▲ or ▼ to select “Custom,” “ISF Night” or “ISF Day” and press **ENTER** again.

### ◄ *Picture Adjust*



**Brightness:** On your external test pattern source, select a PLUGE pattern. (PLUGE is an acronym for “Picture Line-Up Generation Equipment.”) Figure 4-2 shows a typical PLUGE pattern.

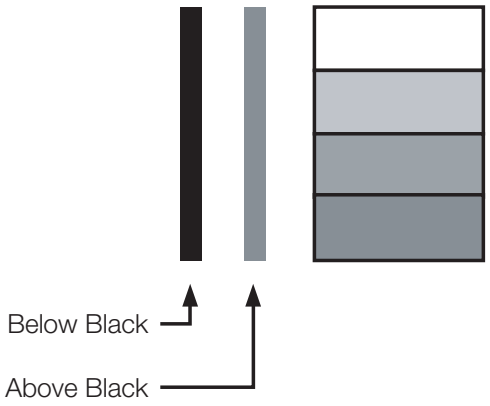



**Figure 4-2. Typical PLUGE Pattern for Adjusting Brightness**

PLUGE patterns vary but generally consist of some combination of black, white and gray areas against a black background. The example above includes two vertical bars and four shaded boxes.

Select Brightness from the Picture Adjust menu and press **ENTER**. Adjust the level so that:

- The darkest black bars disappear into the background.
- The dark gray areas are barely visible.
- The lighter gray areas are clearly visible.
- The white areas are a comfortable level of true white.
- The image contains only black, gray and white (no color).

**Contrast:** On your external test pattern source, select a stepped, gray-bar pattern like the one shown in Figure 4-3.

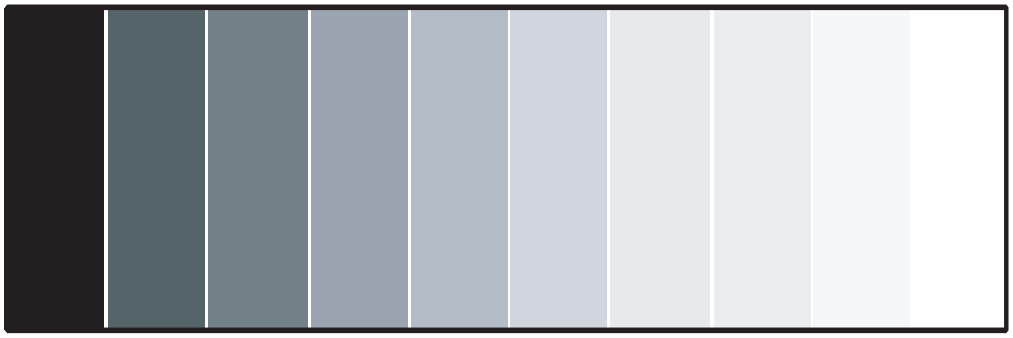


**Figure 4-3. Typical Gray Bar Pattern for Adjusting Contrast**

Select Contrast from the Picture Adjust menu and press **ENTER**. Adjust the contrast to a point just below which the white rectangle starts to increase in size.

**Note**

*Brightness and Contrast controls are interactive. A change to one may require a subtle change to the other in order to achieve the optimum setting.*

**Color:** On your external test pattern source, select a color bar pattern like the one shown in Figure 4-4.

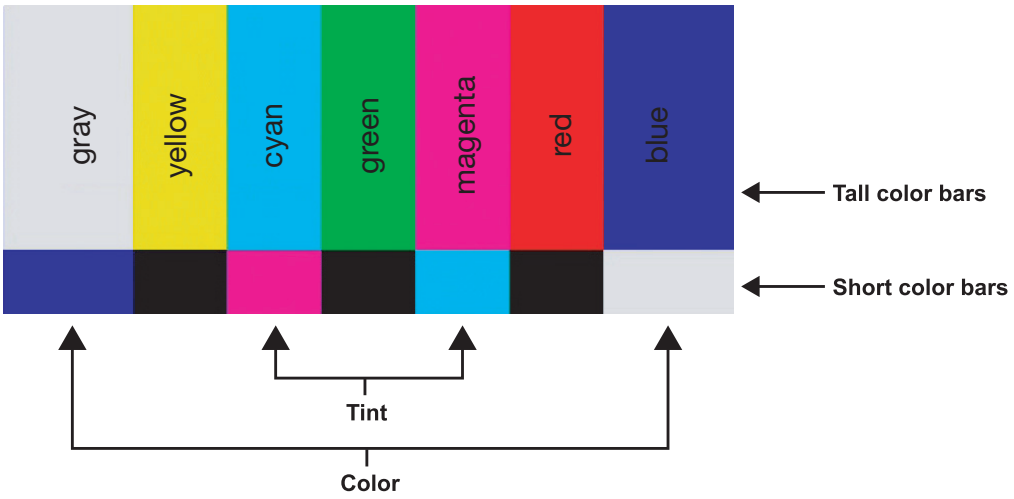
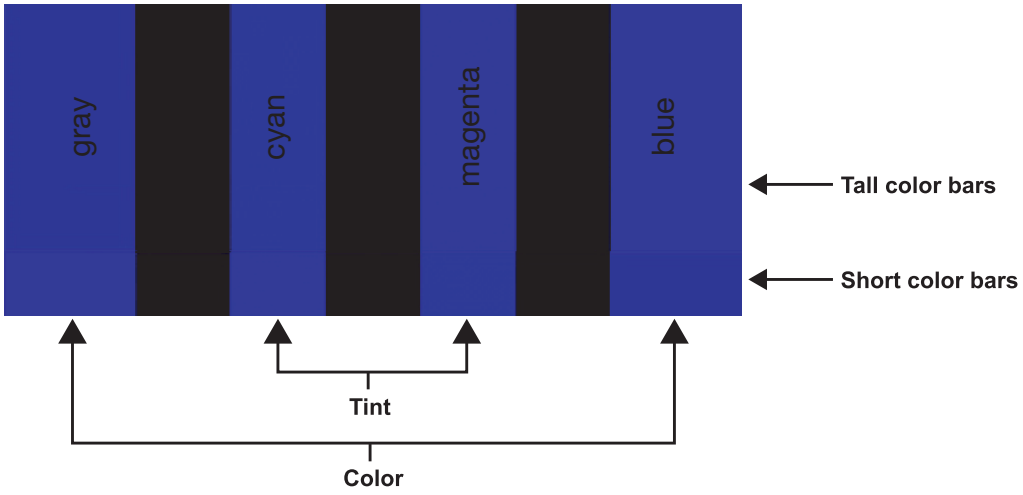



**Figure 4-4. Typical Color Bar Pattern for Adjusting Color Saturation and Tint**

Select Color from the Picture Adjust menu and press **ENTER**. While looking at the color bar pattern through a blue filter, adjust the color saturation level until the outermost (gray and blue) color bars appear to be a single shade of blue:



**Tint:** Tint or “hue” is essentially the ratio of red to green in the color portion of the image. When tint is decreased, the image appears redder; when it is increased the image appears greener. To set the tint, select Tint from the Adjustment menu and press **ENTER**. While looking at the color bar pattern through a blue filter, adjust the tint level until the cyan and magenta color bars (on either side of the green bar) appear to be a single shade of blue.

***Note***

*Like the Brightness and Contrast controls, the color and tint controls are interactive. A change to one may require a subtle change to the other in order to achieve the optimum setting.*

**Sharpness:** “Sharpness” is the amount of high-frequency detail in the image. To adjust sharpness, select Sharpness from the Picture Adjust menu and press **ENTER**. On your external test pattern source, select a pattern like the one shown in Figure 4-5. Adjust as needed, looking for white edges around the transitions from black to gray and differently-sized lines in the “sweep” patterns at the top and bottom. Lower the sharpness setting to eliminate them.

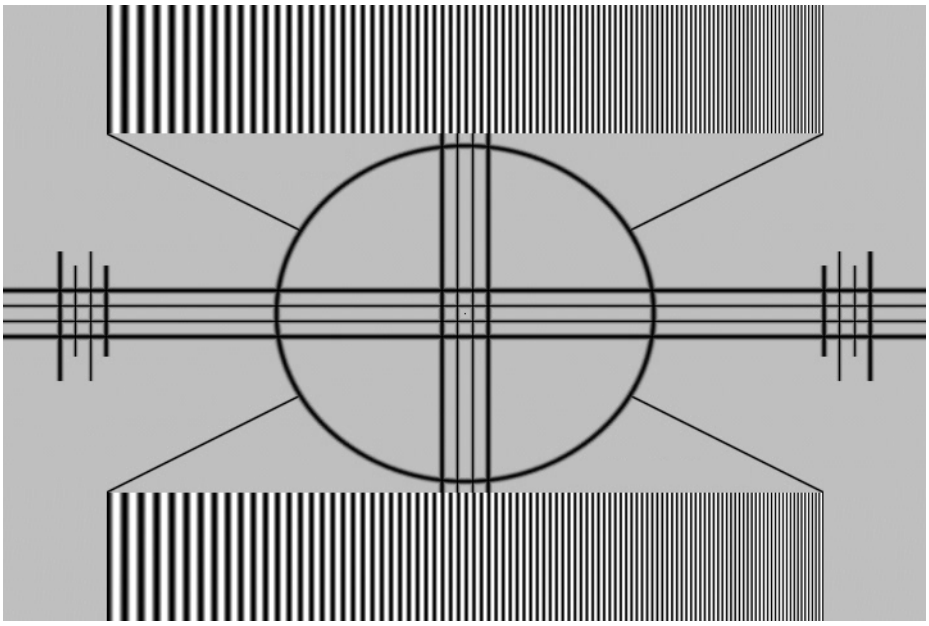


**Figure 4-5. Typical Test Pattern for Adjusting Sharpness**

**Gamma:** The normal gamma setting of 2.2 is correct for almost all signals and conditions. If excess ambient light washes out the image and it becomes difficult or impossible to see details in dark areas, lower the gamma setting to compensate. This will improve contrast while maintaining good details for blacks. Conversely, if the image is washed out and unnatural, with excessive detail in black areas, increase the setting. Again, good gamma improves contrast while maintaining good details for blacks and whites.

**Color Temp.:** To choose a color temperature setting, select Color Temp. from the Picture Adjust menu and press **ENTER**. (Color temperature defines the “color of gray.”) The choices are 5400K, 6500K, 7500K and 8500K. The default setting, 6500K, is appropriate for most situations. Higher settings produce a “bluer” picture; lower ones impart a reddish hue to the image.

**Color Space:** Select Color Space from the Picture Adjust menu to choose the color space of the source signal for HDMI, RGB and component connections.

- The default setting, **Auto**, functions as follows:
  - **HDMI/DVI-D:** If the Auxiliary Video Information (AVI) infoframe contains color space and/or range data, the RS-440 uses that information. Otherwise, for RGB sources, the RS-440 uses the **RGB-Video** color space. For component SDTV and EDTV resolutions, **SDTV** is used. For other component video resolutions, **HDTV** is used.
  - **DVI-A:** If Hsync or Vsync signals are present, the RS-440 uses the **RGB-PC** color space. Otherwise, **SDTV** is used for SDTV and EDTV sources, and **HDTV** for all other sources.
  - **Component:** For SDTV and EDTV resolutions, the RS-440 uses the **SDTV** color space. For all other resolutions **HDTV** is used.

In most cases, the **Auto** setting determines the correct color space to use. If it does not, you can force the RS-440 to use a specific color space. Choose one of the following:

- **HDTV** sets the color space matrix to that defined in ITU-R BT.709.
- **SDTV** sets the color space matrix to that defined in ITU-R BT.601.
- **RGB-PC** uses RGB color space and sets black at 0,0,0 RGB and white at 255,255,255 RGB, assuming an 8-bit image.
- **RGB-Video** uses RGB color space and sets black at 16,16,16 RGB and white at 235,235,235, assuming an 8-bit image, to correspond to the luminance values defined in digital component standards.

**BrilliantColor™:** Select BrilliantColor™ from the Picture Adjust menu to enable (**On**) or disable (**Off**) BrilliantColor processing, which improves brightness in grays and secondary colors by using the spoke light from the color wheel.

**Black Level:** Select Black Level from the Picture Adjust menu to compensate for incoming elevated black levels present in some Composite video and S-Video sources. (This control does not affect other source types.) Set it to **0 IRE** if blacks appear elevated (dark gray). If blacks appear “crushed” (too dark), set it to **7 IRE**.

**Save Settings:** To store changes to picture quality settings for the current input and resolution in the “Custom” Picture Memory, select Save Settings from the Picture Adjust menu. To recall this preset at a later time, press the **CUST** button on the remote control or select “Custom” from the Picture Memory menu (see above).

You should save changes to any of the following settings to a preset; otherwise they will be lost when a new input source or resolution is selected:

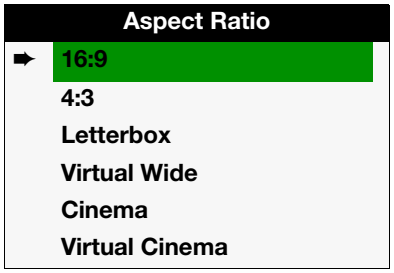
- Aspect ratio (saved per source)
- Picture adjustments (brightness, contrast, color saturation, tint, sharpness, gamma, color temperature, color space, BrilliantColor™ and Black Level)
- RGB/YUV signal settings (H. Position, V. Position, Clock, Phase)
- Setup menu settings (Sync Threshold, DNR, Film Mode, Lamp Power)
- White Balance settings (gain and offset)

***Note***

*To store changes to the ISF Night or ISF Day Picture Memory preset, select Save Settings in the ISF menu (refer to* ***ISF*** *on page 52).* ***You must enter a passcode to access the ISF menu.***

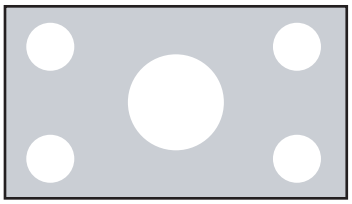
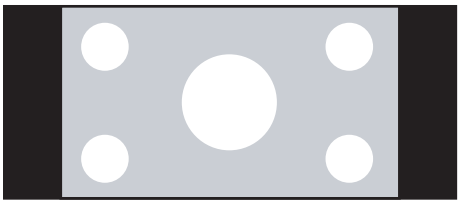
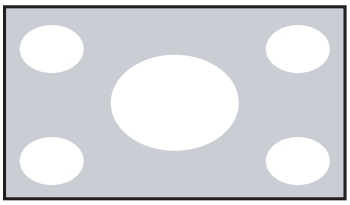
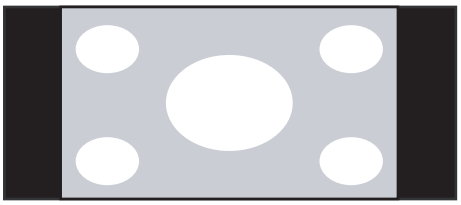
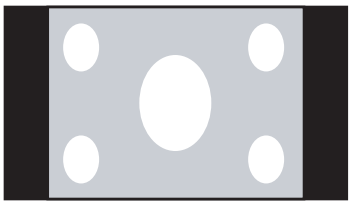
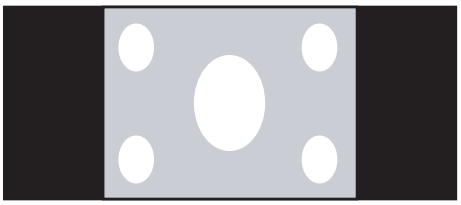
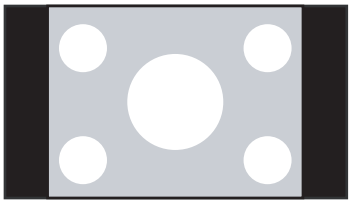
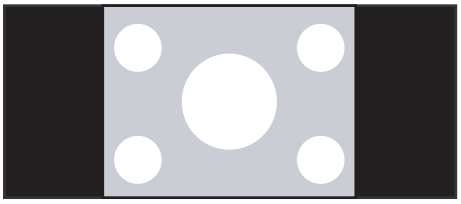
**Reset to Defaults:** To reset all picture quality settings for the current input and resolution to their factory-default values, select Reset to Defaults from the Picture Adjust menu.

***Aspect Ratio*** ➤

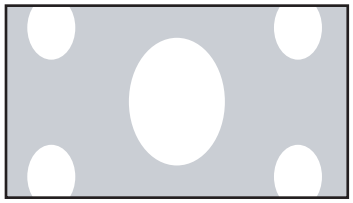
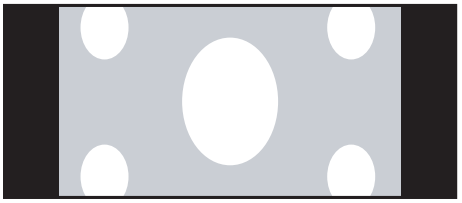
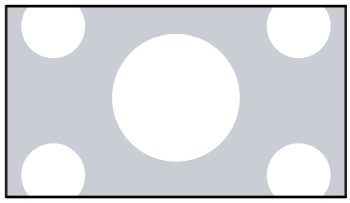
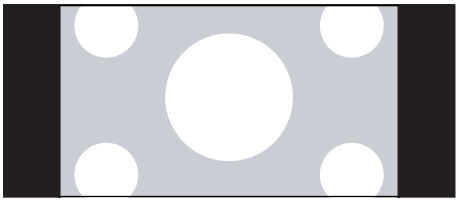
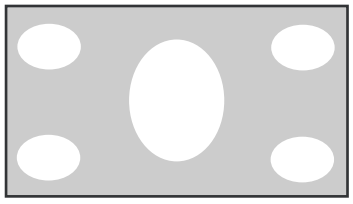
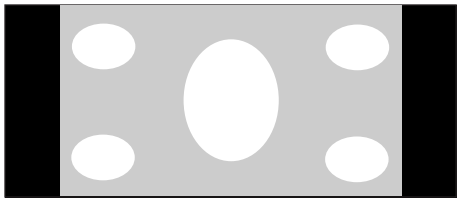
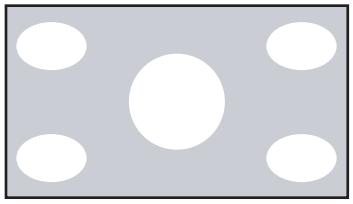
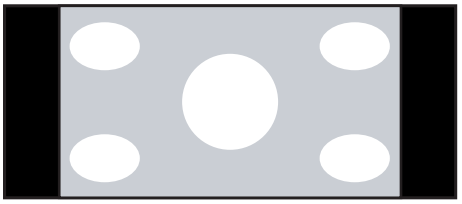



To change the aspect ratio (size and shape) of the projected image, select Aspect Ratio from the Main Menu and press **ENTER**. Select the appropriate aspect ratio for your screen size and the type of program material being viewed, then press **ENTER**; refer to Table 4-1.

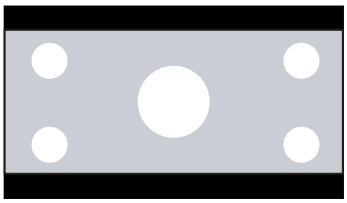
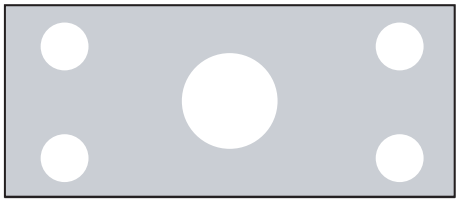
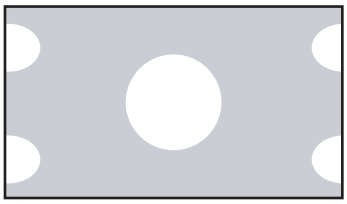
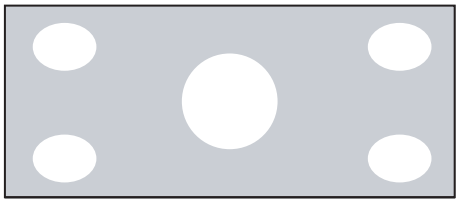
## Table 4-1. Aspect Ratio Settings

| Aspect Ratio Setting | Description | Aspect Ratio of Source Signal | Geometry of Projected Image | |
|---|---|---|---|---|
| | | | Standard RS-440 or RS-440LT (1.78:1 Screen) | RS-440LT/CineWide (2.35:1 Screen) |
| **16:9** | 16:9 linearly scales the source active image horizontally and vertically to fill the 16:9 rectangle of the designated image area. | 16:9 |  |  |
| | | 4:3 |  |  |
| **4:3** | 4:3 linearly scales the source active image horizontally and vertically to fill a 4:3 rectangle which is centered and the same height as the 16:9 designated image area. The remaining area is black. | 16:9 |  |  |
| | | 4:3 |  |  |

## Table 4-1. Aspect Ratio Settings (continued)

| Aspect Ratio Setting | Description | Aspect Ratio of Source Signal | Geometry of Projected Image | |
|---|---|---|---|---|
| | | | **Standard RS-440 or RS-440LT (1.78:1 Screen)** | **RS-440LT/CineWide (2.35:1 Screen)** |
| **Letterbox** | With a 16:9 source image, Letterbox mode crops the top and bottom portion of the image and vertically stretches the remaining portion to fill a 16:9 image area.<br><br>It scales (zooms in on) a 4:3 image linearly (by the same amount on all sides) to fill a 16:9 display. | 16:9 |  |  |
| | | 4:3 |  |  |
| **Virtual-Wide** | A 16:9 image is shrunk horizontally in the center and stretched horizontally in a NON-linear fashion (more on the sides).<br><br>A 4:3 image is horizontally scaled in a NON-linear fashion (more on the sides than in the center) to fit a 16:9 screen. | 16:9 |  |  |
| | | 4:3 |  |  |

## Table 4-1. Aspect Ratio Settings (continued)

| Aspect Ratio Setting | Description | Aspect Ratio of Source Signal | Geometry of Projected Image | |
|---|---|---|---|---|
| | | | Standard RS-440 or RS-440LT (1.78:1 Screen) | RS-440LT/CineWide (2.35:1 Screen) |
| **Cinema** | Select Cinema to view 2.35 source material in its native aspect ratio.<br><br>With a 16:9 screen and a non-CineWide projector (no anamorphic lens), the upper and lower portions of the screen are masked, but the geometry of the active image area is unchanged.<br><br>With a 2.35:1 screen and a CineWide-equipped projector, the video processor scales the 2.35:1 image so that the active image area fills the 16:9 chip surface, eliminating the black bars. The secondary, anamorphic lens then restores the proper geometry to the 2.35:1 image. | 2.35:1 |  |  |
| **Virtual Cinema** | A 16:9 image is scaled NON-linearly (more on the sides than in the center) to fit a 2.35:1 screen.<br><br>Virtual Cinema is available only on the RS-440LT/CineWide. | 16:9 |  |  |

To access the Installation adjustments, press **MENU**, then press the ▲ or ▼ button to highlight Installation and press **ENTER**. The Installation sub-menu appears. Press **EXIT** to return to the previous menu or press **MENU** to close all menus.

◄ ***Installation***

| Installation |
|---|
| **Language** |
| **Orientation** |
| **Keystone** |
| **Overscan** |
| **YUV/RGB Adjust** |
| **OSD Timeout** |
| **Vertical Correction** |

***Note***

*When you change a setting in the Installation menu, the change takes effect immediately; you do not need to press **ENTER** afterwards. (Press **EXIT** to return to the previous menu or **MENU** to exit.)*

**Language:** Select Language from the Installation menu and press **ENTER**. Then, use the ▲ or ▼ button to select from the available languages: English, French, Spanish, German and Italian.

**Orientation:** Select Orientation from the Installation menu and press **ENTER**. Then, use the ▲ or ▼ button to change the orientation of the projected image. The RS-440 can be installed on a ceiling or in a rear-screen configuration with one or more mirrors. There are four settings: Floor Front, Ceiling Front, Floor Rear and Ceiling Rear.

**Keystone:** Projector placement and other factors can cause geometric distortion in the projected image. To correct this, select Keystone from the Installation menu. This sub-menu provides the following options:

| | |
|---|---|
| **V. Keystone** | **0** |
| **H. Keystone** | **0** |

- **V. Keystone/H. Keystone:** To correct distortion resulting from the angle of projection, select V. Keystone or H. Keystone from the Keystone menu and use the ◄ or ► button to make the image rectangular. See Figure 4-6.

***Tip***

*Runco recommends that the keystone feature not be used unless absolutely necessary, as it may cause artifacts in the image.*

***Note***

1. *The RS-440 keystone correction can compensate for up to approximately 15 degrees of screen and/or projector tilt.*
2. *Straight lines or the edges of images may appear jagged while adjusting the image.*

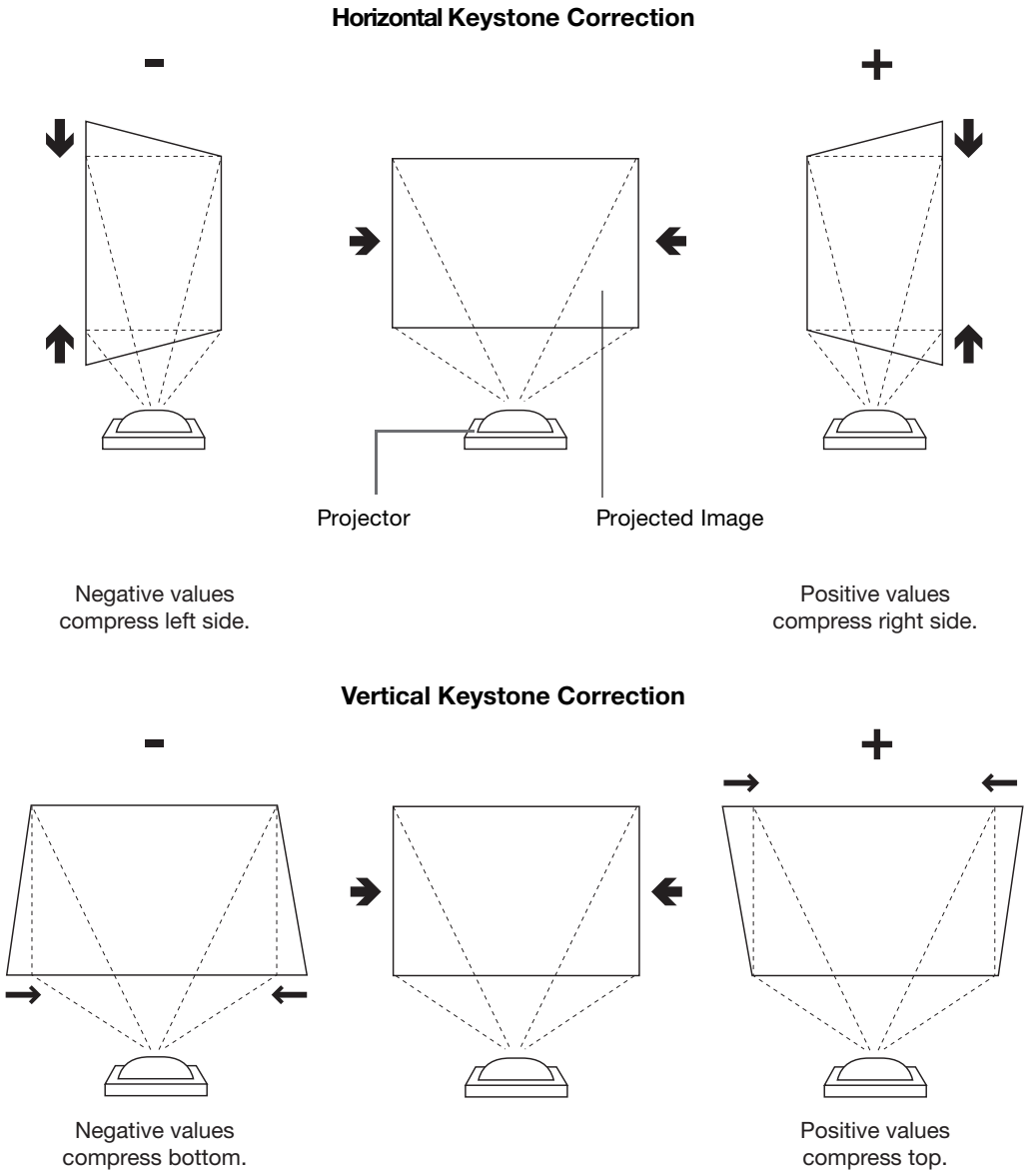



**Figure 4-6. Keystone Correction**

**Overscan:** Some SDTV/EDTV programs are produced based on the assumption that older television sets may not display the outer edges of the broadcast picture area. Overscan effectively hides these inactive, outer edges of the image. (For HDTV, DVDs and other video sources, overscan is generally not necessary or desirable.)

| Overscan Type | Crop |
|---|---|
| Overscan Adjust | 0 |

- **Overscan Type:** There are two overscan types:
  - **Crop** adds a mask at the top, bottom, left and right edges.
  - **Zoom** adds a factor to the scaling of the source image. Anything outside of the original image area is removed.
- **Overscan Adjust:** This control defines the amount of overscan applied to the image. The range is from 0 to 5.
  - In **Crop** mode, each increment adds a mask at the left and right edges of the source image equal to 1% of the displayed horizontal resolution (2% total), and at the top and bottom edges equal to 1% of the displayed vertical resolution (2% total). A setting of 5, for example, crops the image 5% on all sides or 10% total.
  - In **Zoom** mode, each increment adds a factor to the scaling of the source image so that the vertical and horizontal resolutions are 100% plus 2% increments of the size determined by the aspect ratio function. A setting of 5, for example, zooms in on the image 5% on all sides or 10% total.

Figure 4-7 illustrates the effect of each overscan setting.

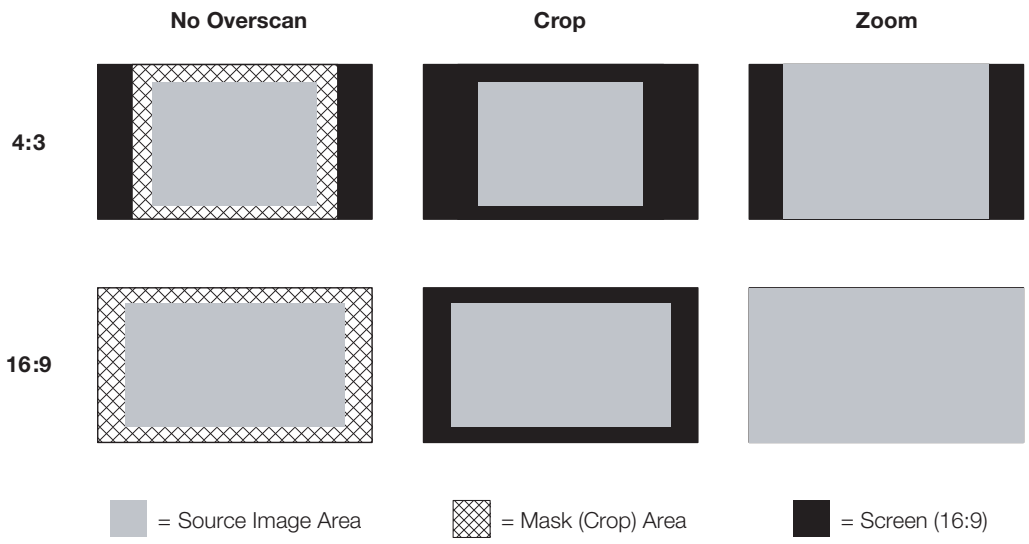



**Figure 4-7. Overscan Examples**

**YUV/RGB Adjust:** Use the settings in the YUV/RGB Adjust menu to fine-tune 480p and higher-resolution signals for optimum picture quality.

- **H. Position:** Use the up- or down-arrow buttons ( ▲, ▼ ) to select H. Position. Then, use the right-arrow button ( ▶ ) to shift the image to the right; use the left-arrow button ( ◀ ) to shift the image to the left.
- **V. Position:** Use the up- or down-arrow buttons ( ▲, ▼ ) to select V. Position. Then, use the right-arrow button ( ▶ ) to shift the image up; use the left-arrow button ( ◀ ) to shift the image down.
- **Clock:** If you notice flickering or vertical noise when displaying computer images, adjust the Clock setting to correct the issue.

- **Phase:** Adjust the phase if the image (usually from an RGB source) shows shimmer or "noise." Pixel phase adjusts the phase of the pixel sampling clock relative to the incoming signal. The effect of this control is similar to that of a tracking control on a VCR.

  For best results, use a good test pattern such as a smooth gray consisting of a clear pattern of black and white pixels, or a similar "half on, half off" graphic image. (You may find that you can stabilize the image at more than one point. Use either setting in this case.)
- **Reset:** Select Reset from the YUV/RGB Adjust menu to restore the position, clock and phase settings to their factory-default values.

**OSD Timeout:** This timer controls how long the menus remain on-screen after selecting them. Select a time-out period of 0, 5, 15 or 60 seconds. When you set the OSD Timeout to 0, the menus remain on-screen until you hide them by pressing **MENU**.

**Vertical Correction (RS-440LT/CineWide only):** To achieve the proper image geometry with the secondary anamorphic lens, select Vertical Correction from the Installation menu. Then, use the ◀ or ▶ button to change the native aspect ratio of the display, in small increments.

The range is from 0 through 5 in increments of 1. Each increment reduces the image height by one percent. A value of 5, for example, reduces the image height by 5 percent.

### *Information* ➤

Select Information from the Main Menu to see projector status information: the currently-active source, input signal resolution, aspect ratio, picture memory and lamp usage. This menu also displays the projector serial number.

Should you ever need to contact Runco Technical Support, this information will help them answer your questions or resolve product performance issues.

| Information | |
|---|---|
| **Source** | **HDMI** |
| **Resolution** | **720x480** |
| **H. Frequency** | **15.7 KHZ** |
| **V. Frequency** | **59.8 HZ** |
| **Aspect Ratio** | **16:9** |
| **Picture Memory** | **ISF Night** |
| **Lamp Hours** | **450** |
| **Firmware** | **0014.006** |
| **Serial** | **RUP440RS0803001** |

To adjust the lamp and perform other common, installation-related tasks, use the up- or down-arrow buttons to highlight Setup in the Main Menu and press **ENTER**.

**Lamp Power:** Select Lamp Power from the Setup Menu to adjust the lamp output level. You can choose to run the lamp as bright as possible (230W; this is the default setting) or you can choose the lower (180W) setting. Generally, lower lamp output prolongs the life of the lamp, but decreases brightness.

**Lamp Reset:** When you replace the projector lamp (refer to ***Lamp Replacement*** on page 58), you should also reset the lamp timer. To do this, select Lamp Reset from the Setup menu. The RS-440 shows the number of hours the projector lamp has been in service and asks you to confirm or cancel the reset. Press **ENTER** to confirm or **EXIT** to cancel.

***Note*** *Reset the Lamp Timer ONLY after you replace the lamp. Otherwise, the reported "Lamp Hours" will be inaccurate.*

***WARNING*** *Do not exceed the recommended lamp life of 2000 hours. An old lamp becomes increasingly fragile and prone to sudden failure.*

**Sync Threshold:** The projector is compatible with EDTV (480p and 576p) and HDTV (720p, 1080i and 1080p) video signals. If a DVD player or other source component is not syncing properly with the projector due to non-standard sync levels, adjust this setting to correct the issue. This setting is only available for component video sources.

**Source Select:** The RS-440 can automatically detect an incoming signal and switch to that input if the current source signal becomes unavailable. To enable automatic source detection, choose Source Select from the Setup menu and set it to **Auto**.

**Film Mode:** Use the Film Mode control to smooth out moving images from interlaced sources. In most cases, the RS-440 detects the proper "pull-down" rate and vertical frequency.

- Choose **Auto** to allow the deinterlacer to automatically determine the proper deinterlacer mode for best display.
- Choose **Off** to force the deinterlacer to ignore film cadence and remain in video mode. Use this setting if "combing" is present or if the deinterlacer switches between modes constantly due to improper detection of film content (which can occur in animation, for instance).

**Digital Noise Reduction (DNR):** Select DNR from the Setup menu, then use the ◀ or ▶ button to adjust the amount of adaptive noise reduction. DNR is useful for clearing up noisy images from interlaced SD sources. Adjust as desired, keeping in mind that reducing noise (which reduces high frequencies) may also soften the image.

**Background Color:** Press the ◀ or ▶ button to select the image Background Color (black or blue). The Background Color appears when no incoming signal is present.

**12V Trigger:** Select 12V Trigger from the Setup menu to configure the 12-volt trigger output.

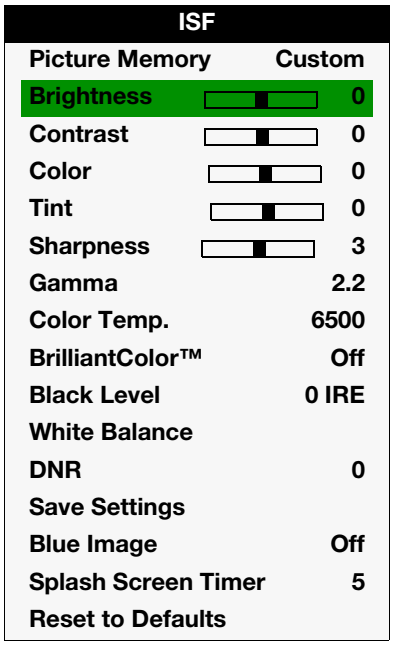
- Set the 12V Trigger to **Normal** if you want the trigger to activate when the projector is turned on (for instance, if the trigger is controlling a retractable screen).
- Set the 12V Trigger to **Cinema** if you want the trigger to activate when the Cinema or Virtual Cinema aspect ratio is selected.

◀ ***Setup***

| Setup | |
|---|---|
| Lamp Power | 230 W |
| Lamp Reset | |
| Sync Threshold | 1 |
| Source Select | Manual |
| Film Mode | Auto |
| DNR | 0 |
| Background Color | Black |
| 12V Trigger | Normal |
| Factory Reset | |

**Factory Reset:** To restore all Setup Menu options to their factory-default values, select Factory Reset and press **ENTER.** Use the arrow buttons to highlight “OK,” then press **ENTER** again to confirm the operation.

***ISF*** ➤ To access the ISF calibration menu, select ISF from the Main Menu and press **ENTER**.




***Note*** *This menu should be used by ISF-certified technicians only. You must enter a passcode to access this menu.*

**Picture Memory:** Refer to ***Picture Memory*** on page 39.

**Brightness:** Refer to ***Brightness*** on page 40.

**Contrast:** Refer to ***Contrast*** on page 40.

**Color:** Refer to ***Color*** on page 41.

**Tint:** Refer to ***Tint*** on page 42.

**Sharpness:** Refer to ***Sharpness*** on page 42.

**Gamma:** Refer to ***Gamma*** on page 42.

**Color Temp.:** Refer to ***Color Temp.*** on page 42.

**BrilliantColor™:** Refer to ***BrilliantColor™*** on page 43.

**Black Level:** Refer to ***Black Level*** on page 43.

**White Balance:** To remove any trace of color from the white areas of the projected image, select White Balance from the ISF menu and press **ENTER**.

- **Gain:** Use the Gain controls to correct color imbalances in the bright areas of the image. A good way to do this is to use a test pattern consisting mostly of solid white areas, such as an 80 IRE “window” pattern. If the white areas contain traces of red, green or blue, decrease the Gain for that color.
- **Offset:** Use the Offset controls in the White Balance sub-menu to correct color imbalances in the dark areas of the image. A good way to do this is to use a test pattern consisting mostly of dark gray areas, such as a 30 IRE “window” pattern. If the gray areas contain traces of red, green or blue, decrease the Offset for that color.

  The Gain controls increase or decrease the full-scale input range; the Offset controls shift the entire range, resulting in a change in brightness.

***Note*** *Generally, higher Gain settings reduce the image contrast; higher Offset settings reduce the image brightness.*

**DNR:** Refer to ***Digital Noise Reduction (DNR)*** on page 51.

**Save Settings:** To store changes to picture quality settings for the current input and resolution in the “Custom,” “ISF Day” or “ISF Night” Picture Memory, choose Save Settings from the Picture Adjust menu and select “Custom,” “ISF Day” or “ISF Night.” To recall this preset at a later time, select it from the Picture Memory menu (see above) or press the corresponding button on the remote control (see Figure 2-3).

For more information about this command, refer to ***Save Settings*** on page 43.

**Blue Image:** This feature, when enabled, removes all red and green color information from the image (simulating a blue filter), and is useful for color-calibrating the projector or other video components.

**Splash Screen Timer:** This timer controls how long the start-up (ISF and Runco logo) image stays on-screen after you turn on the projector. The choices are 0, 5, 15 or 60 seconds. To disable the splash screen, set the Splash Screen Timer to 0.

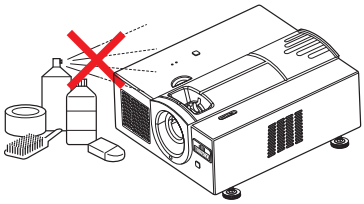
**Reset to Defaults:** Refer to ***Reset to Defaults*** on page 43.

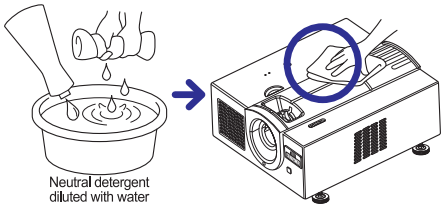
## Notes:

# 5. Maintenance and Troubleshooting

## 5.1 Cleaning the Projector

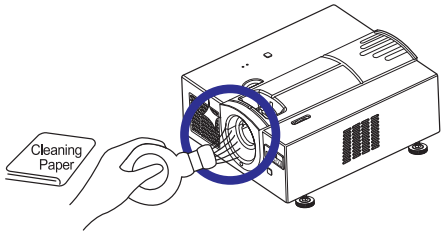
- Unplug the power cord before cleaning the projector.
- Avoid using benzene or thinner, as these can damage the finish on the projector exterior.
- Do not use volatile agents, such as insecticides, on the projector.
- Do not leave rubber or plastic objects in contact with the projector for long periods as they may damage the finish of the projector.
- Wipe off dirt gently with a soft flannel cloth.
- For hard-to-remove dirt, soak a cloth in a neutral detergent diluted with water, wring the cloth well and then wipe the projector.
- Strong cleaning detergents may discolor, warp or damage the coating on the projector. Make sure to test on a small, inconspicuous area on the projector before using.






## 5.2 Cleaning the Lens

- Use a commercially available blower or lens cleaning paper (for glasses and camera lenses) for cleaning the lens. Do not use any liquid cleaning agents, as they may wear the coating film on the surface of the lens.
- The surface of the lens is easily damaged. Do not scrape or hit the lens.

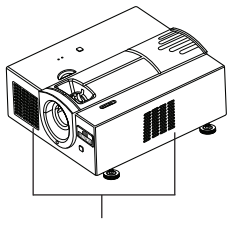


## 5.3 Cleaning the Intake and Exhaust Vents

This RS-440 is equipped with intake and exhaust vents to allow the flow of cool air through the projector and maintain the proper operating temperature.

You should periodically clean the vents by vacuuming them with a vacuum cleaner. Runco recommends doing this after every 100 hours of use, or more often if the projector is used in a dirty or smoky location.

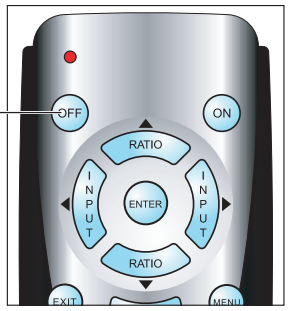
**Side and front view**



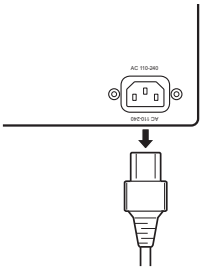
Ventilation holes

To clean the intake and exhaust vents:

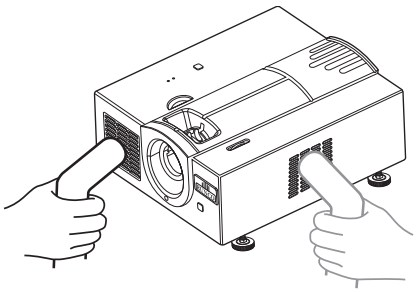
1. Press **OFF** on the remote control to turn off the power. Wait until the cooling fan stops.




2. Unplug the power cord.



3. Remove dust by placing the cleaner hose on the intake and exhaust vents.



## 5.4 Lamp Maintenance

The projector lamp has a life of 2,000 hours. Maintain proper ventilation to keep the lamp operating throughout its lifetime. Do not subject the projector to unnecessary vibration.

- Lamp replacement is recommended after approximately 2,000 cumulative hours of use or when you notice a significant deterioration in the picture and color quality. To find out how long the currently-installed lamp has been in service, select Information from the Main menu.
- The actual lamp service life may be less than 2,000 hours depending on the environment in which the projector is used.
- **For lamp replacement, please contact your nearest Runco authorized service center or Runco dealer. Do not attempt to replace the lamp yourself!**

## 5.5 Lamp Cautions

***Caution***

*This projector uses a pressurized mercury lamp. A loud sound may indicate lamp failure. Lamp failure is caused by excessive shock, improper cooling, surface scratches or deterioration of the lamp due to usage. The period of time up to failure largely varies depending on the individual lamp and the condition and the frequency of use. It is important to note that failure can often result in the bulb cracking.*

*When the lamp replacement indicator and on-screen display icon are illuminated or are flashing, replace the lamp with a new one immediately, even if the lamp appears to be operating normally.*

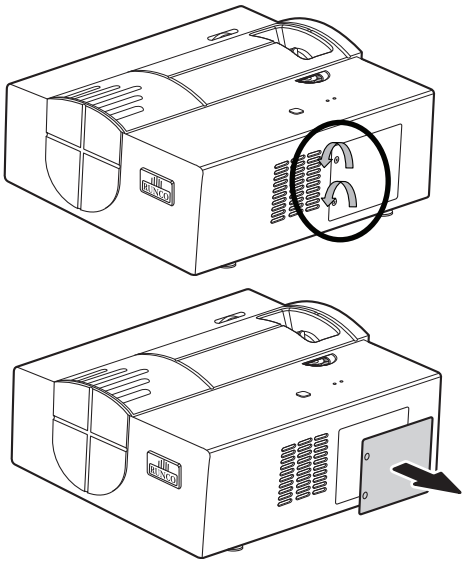
*If the lamp breaks, glass particles may spread inside the lamp cage or gas contained in the lamp may be vented into the room from the exhaust vent. As the gas in this lamp contains mercury, ventilate the room well if the lamp breaks and avoid all exposure to the released gas. In case of exposure to the gas, consult a doctor as soon as possible.*

*If the lamp breaks, there is also a possibility that glass particles may spread inside the projector. If this happens, contact your nearest Authorized Dealer to remove the damaged lamp and ensure safe operation.*

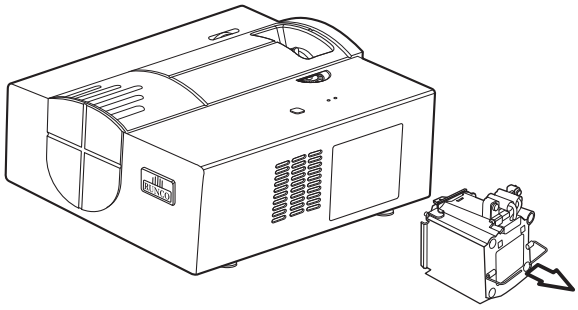
*Do not remove the lamp unit immediately after turning off the projector. Touching a hot lamp can cause burns or injury. Wait at least one hour after the disconnecting the power cord to allow the surface of the lamp unit to fully cool before removing.*

## 5.6 Lamp Replacement

1. Turn off the projector and wait for the cooling fan to stop.
2. Unplug the power cord. Allow the projector to cool down for approximately one hour prior to removing the lamp assembly for replacement.
3. Loosen the two captive lamp cover screws and remove the cover.



4. Loosen the four lamp assembly mounting screws.
5. Grasp the lamp assembly handle and pull gently, removing the lamp module from the projector housing. As you do so, the lamp cooling interlock switch on the inside of the lamp mounting frame (near the top) moves to the OF position.



6. Gently slide the new lamp assembly into the mounting frame. Align the two power connectors at the top of the lamp assembly with the two sockets at the top of the mounting frame. Press gently on both sides of the lamp assembly to snap it into place. As you do so, the lamp cooling interlock switch returns to the ON position.
7. Tighten the lamp assembly mounting screws.
8. Replace the lamp cover and secure the captive lamp cover screws.
9. Plug in the projector and turn it on.
10. Reset the Lamp Timer to zero. To do this, select Lamp Reset from the Setup menu and press **ENTER**. The RS-440 shows the number of hours the projector lamp has been in service and asks you to confirm or cancel the reset. Press **ENTER** again to confirm.

## 5.7 Troubleshooting Tips

Table 5-1 provides some general guidelines for troubleshooting problems you may encounter with the RS-440. If you encounter an issue not described here, please contact your Runco dealer or Runco Technical Support.

### Table 5-1. Troubleshooting Chart

| Symptom | Possible Cause(s) | Solution |
|---|---|---|
| The projector does not turn on after initial installation. | • The RS-440 is not plugged in or the AC outlet is not active.<br>• The remote control batteries have run out. | • Ensure that the RS-440 is plugged in and that the AC outlet is active.<br>• Replace the batteries. |
| The projector is on, but there is no video image on-screen. | • Incorrect source selection.<br>• Source component is not turned on. | • Select the correct source.<br>• Turn on the source component. |
| A projected image from a DVD is split or otherwise scrambled. | • DVD player is set to progressive scan mode. | • Turn off progressive scan on the DVD player.<br>• Connect the DVD player to the Component input. |
| Image is too bright and/or lacks definition in the bright areas of the image. | • Contrast is set too high. | • Lower the contrast setting. |
| Image appears “washed out” and/or dark areas appear too bright. | • Brightness is set too high. | • Lower the brightness setting. |
| Colors in the image are swapped; for example, reds appear blue or vice versa. | • The Red/Pr, Green/Y or Blue/Pb outputs from the source are connected to the wrong inputs on the RS-440. | • Ensure that the source outputs are connected to the correct RS-440 input. |
| RGB-HD images appear “noisy.” | • Clock and Phase settings need adjustment. | • Manually adjust Clock and Phase settings, or perform an Auto-Tune (refer to ***YUV/RGB Adjust*** on page 49). |
| The projector will not turn back on after it was powered down, or the image disappears during operation. | • The projector will not turn on for two minutes after power-down, to protect the lamp.<br>• The lamp has failed or was improperly installed. | • Wait until the cooling fan stops.<br>• Replace or re-install the lamp. |

## Notes:

# 6. Serial Communications

## 6.1 RS-232 Connection and Port Configuration

To interface the RS-440 with a home theater automation/control system or a PC running terminal emulation software, connect it to your control system or PC as shown in Figure 3-13.

Configure the RS-232 controller or PC serial port as follows: no parity, 8 data bits, 1 stop bit and no flow control. Set the baud rate to 9600, to match that of the RS-440 RS-232 port.

## 6.2 Serial Command Syntax

Table 6-1 lists the RS-232 command set. All commands are in ASCII format and must be in UPPERCASE.

When you send a valid command, the RS-440 executes it and acknowledges it with the first three characters of the command followed by "OK;" for example, "`RRAOK`." When you send an invalid command, the RS-440 ignores it and returns the first three characters of the command followed by "NG;" for example, "`RRXNG`."

**Table 6-1. Serial Commands**

| Command | Description | Reply |
|---|---|---|
| RRA00 | Saves current settings to the CUSTOM memory (Note 1) | RRAOK |
| RRA01 | Saves current settings to the ISF Day memory (Note 1) | RRAOK |
| RRA02 | Saves current settings to the ISF Night memory (Note 1) | RRAOK |
| RRB00 | Recalls the Custom memory settings | RRBOK |
| RRB01 | Recalls the ISF Day memory settings | RRBOK |
| RRB02 | Recalls the ISF Night settings | RRBOK |
| RRC00 | Selects the S-VIDEO input | RRCOK |
| RRC01 | Selects the COMPOSITE VIDEO input | RRCOK |
| RRC02 | Selects the COMPONENT input | RRCOK |
| RRC03 | Selects the DVI-D input | RRCOK |
| RRC04 | Selects the HDMI input | RRCOK |
| RRC05 | Selects the DVI-A input | RRCOK |

*Notes:*

1. *All image quality settings must be made with the remote control. After the image adjustments are complete, you can use these commands to store the settings in the selected memory.*
2. *The power on command (PON) will not provide an OK reply; it will instead reply with a random character. For your automation system, simply ensure that you receive a character after the PON command. If you do not get any reply after PON, send PON again.*

**Table 6-1. Serial Commands (continued)**

| Command | Description | Reply |
|---|---|---|
| RRD00 | Selects the 16:9 aspect ratio | RRDOK |
| RRD01 | Selects the 4:3 aspect ratio | RRDOK |
| RRD02 | Selects the LETTERBOX aspect ratio | RRDOK |
| RRD03 | Selects the VIRTUALWIDE aspect ratio | RRDOK |
| RRD04 | Selects the CINEMA (2.35:1) aspect ratio | RRDOK |
| RRD05 | Selects the VIRTUAL CINEMA aspect ratio | RRDOK |
| RRE00 | Turns the projector OFF | RREOK |
| PON | Turns the projector ON | Random (Note 2) |
| RRF00 | Selects the **UP** button on the remote control | RRFOK |
| RRF01 | Selects the **DOWN** button on the remote control | RRFOK |
| RRF02 | Selects the **LEFT** button on the remote control | RRFOK |
| RRF03 | Selects the **RIGHT** button on the remote control | RRFOK |
| RRF04 | Selects the **ENTER** button on the remote control | RRFOK |
| RRG00 | Selects the **MENU** button on the remote control | RRGOK |
| RRG01 | Selects the **EXIT** button on the remote control | RRGOK |

*Notes:*

1. *All image quality settings must be made with the remote control. After the image adjustments are complete, you can use these commands to store the settings in the selected memory.*
2. *The power on command (PON) will not provide an OK reply; it will instead reply with a random character. For your automation system, simply ensure that you receive a character after the PON command. If you do not get any reply after PON, send PON again.*

# 7. Specifications

## 7.1 RS-440 Specifications

Table 7-1 lists the RS-440 specifications.

### Table 7-1. RS-440 Specifications

| | |
|---|---|
| **Projector Type:** | Digital Light Processing (DLP), Single-Chip SuperOnyx DMD |
| **Native Resolution:** | 1280 x 720 (16:9) |
| **Aspect Ratios:** | 4:3, Letterbox, 16:9, VirtualWide, Cinema, Virtual Cinema |
| **Video Standards:** | NTSC, PAL, SECAM |
| **Video Compatibility:** | 480i, 480p, 576i, 576p, 720p, 1080i, 1080p |
| **Scan Frequency:** | Horizontal: 15 - 91 kHz<br>Vertical: 24 - 85 Hz |
| **Picture Size (16:9 Screen):** | Recommended Width: 72 in. (1.83 m) to 120 in. (3.05 m) |
| **Throw Distance (Factor x Screen Width):** | Refer to Table 3-3 |
| **Horizontal and Vertical Offset (when projector is inverted):** | Refer to Table 3-4 |
| **Lamp:** | 230 Watts |
| **Estimated Lamp Life:** | 2000 hours |
| **Video Inputs:** | (1) Composite<br>(1) S-Video<br>(1) RCA Component (YPbPr)<br>(1) DVI-I<br>(1) HDMI with HDCP |
| **Control Options:** | - Discrete IR remote<br>- Serial commands via RS-232 |
| **RS-232 Communication Parameters:** | 9600 bps, no parity, 8 data bits, 1 stop bit, no flow control |
| **+12V Output:** | Max. 0.25 Amps, active when Cinema or Virtual Cinema Aspect Ratio is selected (RS-440LT/CineWide only) or when projector is turned on;<br>Tip = +12V; Sleeve = Ground |
| **Power Requirements:** | 100 to 240 VAC (auto-sensing), 50/60 Hz, 330 Watts (1126.3 BTUs/hour) |
| **Operating Environment:** | 41°F to 95°F (5°C to 35°C), 0% to 90% humidity (non-condensing) |
| **Dimensions:** | **RS-440:** See Figure 7-1<br>**RS-440LT:** See Figure 7-2 |

## Table 7-1. RS-440 Specifications (continued)

| | |
|---|---|
| **Weight (including lens):** | **RS-440:** 30.1 lbs. (13.65 kg)<br>**RS-440LT:** 30.8 lbs. (13.97 kg) |
| **Regulatory Approvals:** | Complies with FCC Class B, CE, C-Tick, GOST |
| **Limited Warranty:** | Projector: Two (2) years parts and labor from the date of delivery to the end user.<br>Lamp: 1000 hours or six (6) months, whichever comes first. |

**Specifications are subject to change without notice.**

## 7.2 RS-440 Dimensions

Figure 7-1 shows the RS-440 dimensions.

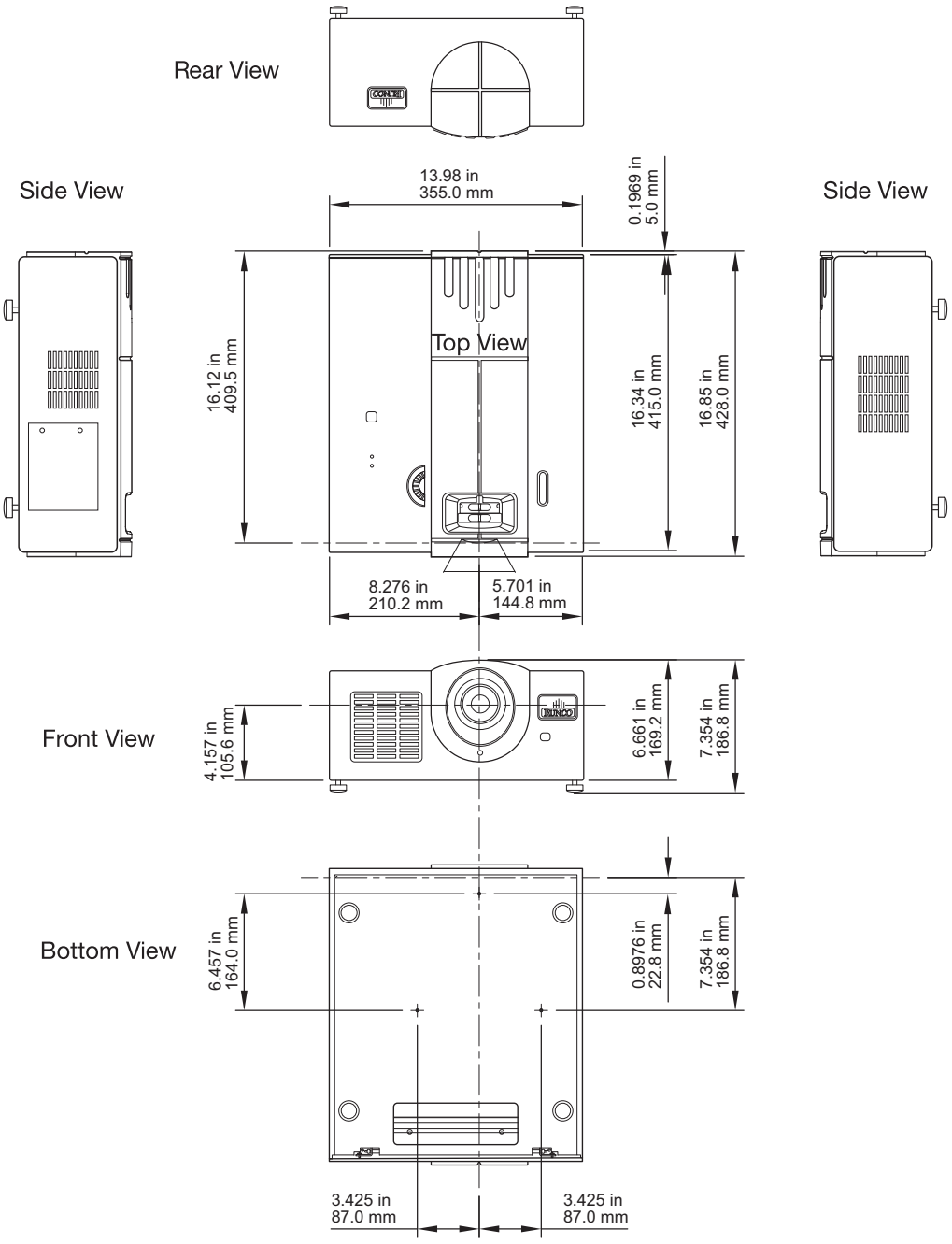



**Figure 7-1. RS-440 Dimensions**

## 7.3 RS-440LT Dimensions

Figure 7-2 shows the RS-440LT dimensions.

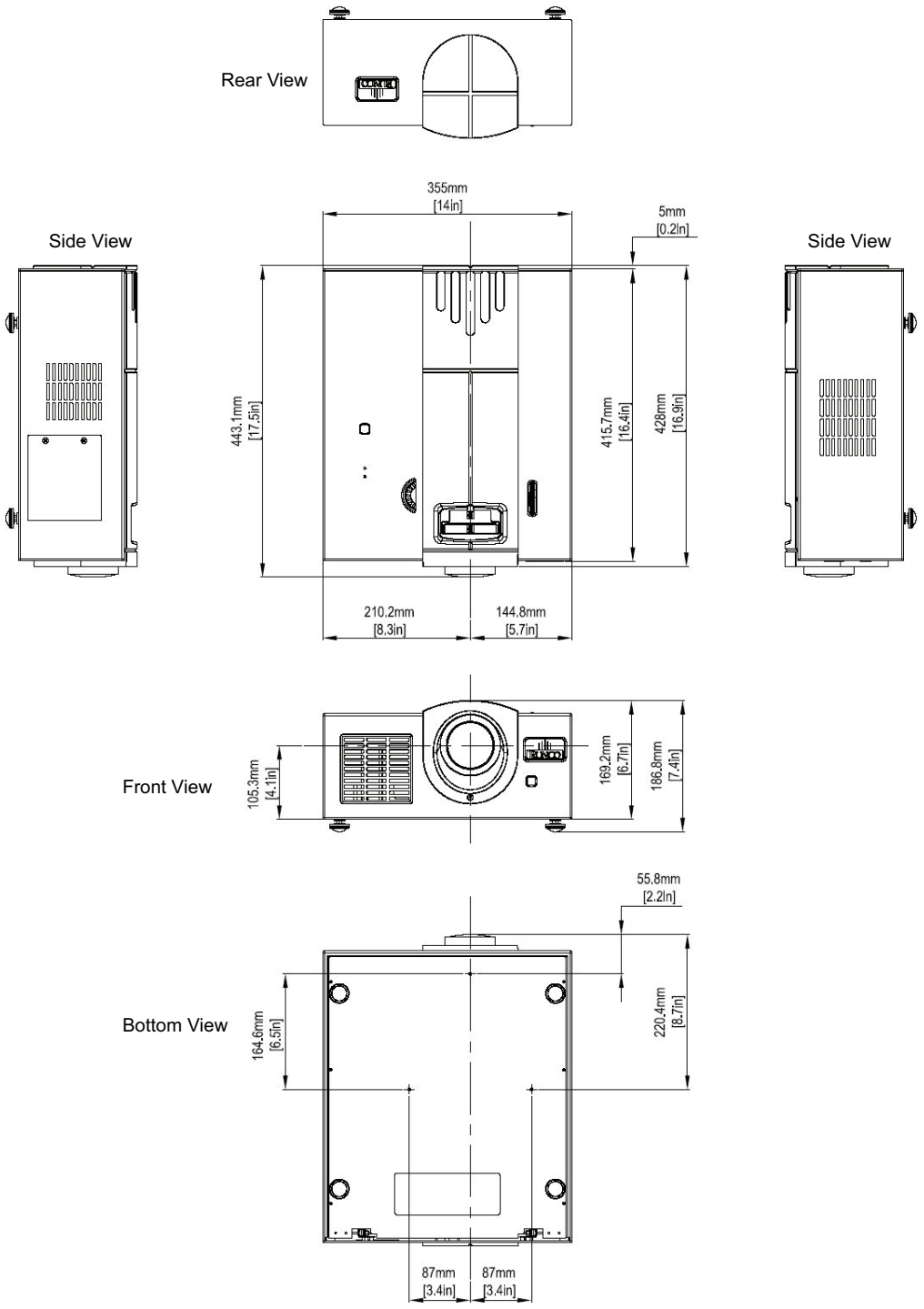



**Figure 7-2. RS-440LT Dimensions**

## 7.4 Computer Signal Compatibility

The RS-440 can display video signals from a variety of computer sources via its DVI-I and HDMI inputs.

Table 7-2 lists the signal types that are compatible with the RS-440, and indicates which of those are VESA standards.

### Table 7-2. Computer Signal Compatibility Chart

| PC/MAC/ WS | Resolution | | Horizontal Frequency (kHz) | Vertical Frequency (Hz) | VESA Standard | HDMI Support |
|---|---|---|---|---|---|---|
| PC | VGA | 720 x 400 | 31.5 | 70 | | √ |
| | | 640 x 480 | 31.5 | 60 | | √ |
| | | | 37.9 | 72 | √ | √ |
| | | | 37.5 | 75 | √ | √ |
| | | | 43.3 | 85 | √ | √ |
| | SVGA | 800 x 600 | 35.1 | 56 | √ | √ |
| | | | 37.9 | 60 | √ | √ |
| | | | 48.1 | 72 | √ | √ |
| | | | 46.9 | 75 | √ | √ |
| | | | 53.7 | 85 | √ | √ |
| | XGA | 1024 x 768 | 48.4 | 60 | √ | √ |
| | | | 56.5 | 70 | √ | √ |
| | | | 60.0 | 75 | √ | √ |
| | | | 68.7 | 85 | √ | √ |
| | WXGA | 1280 x 768 | 47.8 | 60 | | √ |
| | SXGA | 1280 x 1024 | 64.0 | 60 | √ | √ |
| | | | 80.0 | 75 | √ | √ |
| | | | 91.1 | 85 | √ | √ |
| | WSXGA+ | 1680 x 1050 | 65.2 | 60 | | √ |
| | UXGA | 1680 x 1200 | 75.0 | 60 | √ | √ |
| MAC 13” | VGA | 640 x 480 | 34.9 | 67 | | √ |
| MAC 16” | SVGA | 832 x 624 | 49.6 | 75 | | √ |
| MAC 19” | XGA | 1024 x 768 | 60.2 | 75 | | √ |

***Notes:***

1. *This projector may not be able to display images from notebook computers in simultaneous (CRT/LCD) mode. Should this occur, switch the notebook computer to “CRT only” mode. If you are unsure how to do this, refer to your notebook computer’s user manual.*
2. *Interlaced video signals received through the DVI-I input may not display correctly. If this occurs, use the Component, S-video or Composite video input instead.*
3. *The RS-440 does not support composite sync or sync-on-green RGB signals.*

## 7.5 Video Signal Compatibility

Table 7-3 lists numerous common video signal formats and indicates which input(s) on the RS-440 can accept a given format.

### Table 7-3. Video Signal Compatibility Chart

| Resolution | | | H-Freq (kHz) | V-Freq (Hz) | Compatible Inputs (Note 1) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Comp. | S-Video | Com-posite | DVI-A | DVI-D | HDMI |
| SD Video | NTSC | 640 x 480i | 15.73 | 59.94/60 | √ | √ | √ | √ | √ | √ |
| | PAL | 768 x 576i | 15.63 | 50 | √ | √ | √ | √ | √ | √ |
| | SECAM | | | | √ | √ | √ | √ | √ | √ |
| | NTSC-4.43 | | 15.73 | 59.94/60 | (adjustment required) | | | | | |
| | PAL-M | | 15.73/15.75 | 59.94/60 | | | | | | |
| | PAL-N | | 15.63 | 50 | | | | | | |
| | NTSC-J | | 15.73 | 59.94/60 | | | | | | |
| | PAL-60 | | 15.73/15.75 | 59.94/60 | | | | | | |
| | NTSC-50 | (not supported) | | | | | | | | |
| EDTV | 480p | 720 x 480p | 31.5 | 59.94/60 | √ | | | √ | √ | √ |
| | 576p | 720 x 576p | 31.3 | 50 | √ | | | √ | √ | √ |
| HDTV | 1080i/50 | 1920 x 1080i | 28.1 | 50 | √ | | | √ | √ | √ |
| | 1080i/60 | | 33.8 | 59.94/60 | √ | | | √ | √ | √ |
| | 720p/50 | 1280 x 720p | 37.5 | 50 | √ | | | √ | √ | √ |
| | 720p/60 | | 45.0 | 59.94/60 | √ | | | √ | √ | √ |
| | 1080p/24 | 1920 x 1080p | 26.98/27 | 23.98/24 | √ | | | √ | √ | √ |
| | 1080p/50 | | 56.25 | 50 | √ | | | √ | √ | √ |
| | 1080p/60 | | 67.4/67.5 | 59.94/60 | √ | | | √ | √ | √ |

***Notes:*** *The Component input accepts both analog (YPbPr) and digital (YCbCr) signals.*

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